BREEDING STUDIES IN SANSEVIERIA AND KENAF

Annual Report for 1954

James B. Pate

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SANSEVIERIA

INTRODUCTIONS - CLONAL SELECTION

During 1954, introductions were received through the Section of Plant Introduction from Israel and Egypt. Three clones were brought in from Hawaii by Mr. Robert Kern of Miami. Another type of sansevieria was obtained from Mr. Bond of Belle Glade. In addition, all parent plants used in crossing were maintained as separate clones. Clonal designations, date received, location collected and other pertinent information for all sansevieria obtained in 1954 follows:

S. trifasciata - parent clones of hybrids and backcrosses made in 1954:

1. tri C-7-26 - parent of H54-1, -3
2. tri C-7-27 - parent of H54-4, -9
3. tri C-7-28 - parent of H54-102, -103
4. tri C-7-29 - parent of H54-107, -117
5. tri C-7-30 - parent of H54-95, -101
6. tri C-7-31 - parent of H54-82, -94
7. tri C-7-32 - parent of H54-10, -81

S. laurentii - clonal introductions:

1. lau C-40. June 1954. Egypt, PI 217980. Green variegated. Labeled trifasciata.
2. lau C-41. June 1954. Egypt, PI 217981. Yellow margin. Labeled laurentii.
3. lau C-42. June 1954. Egypt, PI 217982. Yellow margin. Labeled S. sp.
4. lau C-43. August 1954. Hawaii. Obtained from Mr. Robert Kern, Miami.

BANANYANIA

INTRODUCTIONS - CLONAL SELECTION

During 1954, introductions were received through the Section of Plant Introduction from Yarsal and Egypt. Three clones were brought in from Hamata by Mr. Robert Kern of Miami. Another type of musaceae was obtained from Mr. Bond of Belle Glade. In addition, all parent plants used in crossing were maintained as separate clones. Clonal designations, date received, location collected and other pertinent information for all musaceae obtained in 1954 follows:

B. triploeuploids - parent clones of hybrids and backcrosses made in 1954:

1. Int C-7-26 - parent of RS4-1, -9
2. Int C-7-27 - parent of RS4-4, -9
3. Int C-7-28 - parent of RS4-102, -103
4. Int C-7-29 - parent of RS4-107, -117
5. Int C-7-30 - parent of RS4-95, -101
6. Int C-7-31 - parent of RS4-82, -94
7. Int C-7-32 - parent of RS4-10, -81

B. Lacuyntii - clonal introductions:

1. Jan C-40. June 1954. Egypt, PI 217960. Green variegated. Labeled triploeuploids.
2. Jan C-41. June 1954. Egypt, PI 217963. Yellow margin. Labeled Lacuyntii.
3. Jan C-42. June 1954. Egypt, PI 217962. Yellow margin. Labeled B. sp.
4. Jan C-43. August 1954. Hamata. Obtained from Mr. Robert Kern, Miami.

S. longiflora - clonal introductions:

1. Ion C-7. June 1954. Egypt, PI 217978. Labeled S. metallica.
2. Ion C-8. June 1954. Egypt, PI 217983. Labeled S. sp.
3. Ion C-9. June 1954. Israel, PI 219819. Labeled S. zeylanica.

Other species:

1. S. grandis. June 1954. Egypt, PI 217977.
2. S. schweinfurthii. June 1954. Egypt, PI 217979.
3. S. hahnii. August 1954. Hawaii. Obtained from Mr. Robert Kern, Miami.
4. S. sp. August 1954. Hawaii. Obtained from Mr. Robert Kern, Miami. Similar to S. pumila, PI 188914.
5. S. sp. July 1954. Obtained from Mr. Bond, Belle Glade. Similar to S. pumila, PI 188914.

These introductions and those listed in previous annual reports are maintained in 6 x 9 foot plots in two nursery experiments (Sansevieria 52-1 and 52-11) at the Hays Farm. Clones in 52-1 were cut back in January of 1954 to eliminate differences in plots caused by variable amounts of planting stock and different times of planting. Regrowth during the year has been good and real differences between species and clones are more readily apparent. Most clones in 52-11 are well established, and it seems advisable to cut them back in the near future.

Leaf length data were collected in January 1955 in the two clonal selection experiments (Sansevieria 52-4 and 52-16). Ten leaves per plot were measured. These data were analyzed statistically and means and analysis data are presented in Tables 1 and 2. In experiment 52-4, data from previous years on leaf length are given for comparison.

B. fourfloras - clonal introductions:

1. Ion C-7. June 1954. Egypt, PI 217972. Labeled B. metallica.

2. Ion C-8. June 1954. Egypt, PI 217973. Labeled B. sp.

3. Ion C-9. June 1954. Isreal, PI 218219. Labeled B. metallica.

Other species:

1. B. grandis. June 1954. Egypt, PI 217977.

2. B. polymorphifolia. June 1954. Egypt, PI 217979.

3. B. parvula. August 1954. Hawaii. Obtained from Mr. Robert Kern, Niaua.

4. B. sp. August 1954. Hawaii. Obtained from Mr. Robert Kern, Niaua. Similar to B. grandis, PI 180914.

5. B. sp. July 1954. Obtained from Mr. Bond, Bella Vista. Similar to B. grandis, PI 180914.

These introductions and those listed in previous annual reports are maintained in 6 x 9 foot plots in two nursery experiments (Sanseviera 52-3 and 52-11) at the Kays Farm. Clones in 52-1 were cut back in January of 1954 to eliminate differences in plots caused by variable amounts of planting stock and different times of planting. Regrowth during the year has been good and real differences between species and clones are more readily apparent. Most clones in 52-11 are well established, and it seems advisable to cut them back in the near future.

Leaf length data were collected in January 1955 in the two clonal selection experiments (Sanseviera 52-4 and 52-16). Ten leaves per plot were measured. These data were analyzed statistically and mean and analysis data are presented in Tables 1 and 2. In experiment 52-4, data from previous years on leaf length are given for comparison.

Table 1. Length of leaf in sansevieria clonal selection experiment.
Sansevieria experiment 52-4 planted January 1952.

Clone	Location Collected	Leaf Length, Inches 1/15/53	12/20/53	1/11/55
tri C-5	Arcadia	10.8	20.7	26.9
tri C-7	Arcadia	11.5	20.8	27.6
tri C-8	Homestead	11.4	24.5	28.6
tri C-12	Arcadia	9.7	19.0	26.0
tri C-13	Winter Haven	11.8	23.6	29.8
tri C-14	Dania	13.2	25.5	34.5
lau C-4	Boynton	12.6	20.8	21.0
lau C-5	Jupiter	12.7	20.5	20.1
lau C-15	Boynton	11.9	20.2	19.0
gui C-7	Boynton	12.0	19.9	23.1
gui C-11	Terra Ciea	15.9	26.6	28.6
gui C-12	Boynton	14.0	24.2	26.0
C.V.		[illegible]	[illegible]	12.3
LSD 05		1.4	5.0	6.5
LSD 01		1.9	6.7	8.8

Analysis of Variance - Mean Squares

Source	DF	Leaf Length, Inches 1/15/53	12/20/53	1/11/55
Reps	3	2.51	6.04	421
Clones	11	10.20**	25.85*	806**
Error	33	.94	12.02	209
Sampling	432			8

*Significant
**Highly Significant

Table 1. Length of leaf in successive diurnal selection experiments.

Successive experiments 52-4 planted January 1952.

Clone	Location Replicated	Leaf Length, Inches 1/14/52	12/20/52	1/21/53
Wri 0-9	Arcadia	10.8	20.7	26.9
Wri 0-7	Arcadia	11.5	20.8	27.6
Wri 0-8	Homestead	11.4	24.3	26.6
Wri 0-12	Arcadia	9.7	19.0	26.0
Wri 0-13	Winter Haven	11.8	23.6	29.8
Wri 0-14	Davie	13.8	25.3	34.5
Jan 0-4	Boynton	12.6	20.8	23.0
Jan 0-5	Jupiter	12.7	20.3	20.1
Jan 0-15	Boynton	11.9	20.2	19.0
Pal 0-7	Boynton	12.0	19.9	23.1
Pal 0-11	Terra Ceia	14.9	26.6	28.6
Pal 0-12	Boynton	14.0	24.2	26.0
C.V.				12.3
LSD 05		1.4	5.0	6.5
LSD 01		1.9	6.7	8.8

Analysis of Variance - Mean Squares

Source	DF	Leaf Length, Inches 1/14/52	12/20/52	1/21/53
Rep	3	2.21	6.04	4.23
Clone	11	10.20**	29.85*	80.8**
Error	33	.94	12.02	8.09
Remainder	432			8

*Significant

**Highly Significant

Table 2. Length of leaf in sansevieria clonal selection experiment.
Sansevieria experiment 52-16 planted November 1952

Clone	Location Collected	Leaf Length, In. 1/11/55
tri C-2	Bradenton	16.4
tri C-7	Arcadia	17.0
tri C-9	Costa Rica	18.7
tri S49-1	Seedling clone	15.9
lau C-1	Sebring	14.4
lau C-9	Winter Haven	13.9
C.V.		5.9
LSD 05		2.0
LSD 01		2.8

Analysis of Variance - Mean Squares

Source	DF	Leaf Length, In. 1/11/55
Reps	3	74
Clones	5	121**
Error	15	18
Sampling	216	5

**Highly Significant

Table 2. Length of leaf in successive clonal selection experiment.
Germesteria excretiorum 33-16 planted November 1952

Clone	Location Collected	Leaf Length, In. 1/11/55
Tri 0-2	Pinehaven	16.4
Tri 0-7	Arcadia	17.0
Tri 0-9	Costa Rica	18.7
Tri 31-1	Seedling clone	15.9
Ian 0-1	Sebring	14.4
Ian 0-9	Winter Haven	13.9
C.V.		5.9
LSD 05		2.0
LSD 01		2.8

Analysis of Variance - Mean Squares

Source	DF	Leaf Length, In. 1/11/55
Reps	3	7A
Clones	5	127**
Error	15	18
Corrected	23	5

**Highly Significant

Differences between clones for leaf length in January 1955 were highly significant in both experiments. However, the large differences are between species or varieties (trifasciata and guineensis vs. laurentii) rather than clones of the same species. In 52-4 within trifasciata, leaves were found to be longest in the Dania clone each year. In guineensis, the Terra Ciea clone has consistently given greater length.

It is interesting to note that the laurentii clones compared favorably with the trifasciata and guineensis clones after 1 and 2 years' growth. However, the characteristic short leaf of laurentii became very evident during the third year when these clones grew little or none at all in height.

It is expected that 52-4 will be harvested in late 1955 or early 1956. Experiment 52-16 will probably be harvested in late 1956 or early 1957.

Differences between clones for leaf length in January 1955 were highly significant in both experiments. However, the large differences are between species or fascicles (trifoliolate and pulmonaria vs. laurentii) rather than clones of the same species. In 52-4, within trifoliolate, leaves were found to be longest in the Dania clone each year. In pulmonaria, the Terra Ilex clone has consistently given greater length.

It is interesting to note that the laurentii clones compared favorably with the trifoliolata and pulmonaria clones after 1 and 2 years' growth. However, the characteristic short leaf of laurentii became very evident during the third year when these clones grew little or none at all in height.

It is expected that 52-4 will be harvested in late 1955 or early 1956. Experiment 52-16 will probably be harvested in late 1956 or early 1957.

SEEDLING SELECTION IN S. TRIFASCIATA

In 1951, two hundred and ninety-two trifasciata seedlings were planted at Fort Lauderdale with three foot spacings between seedlings. In three years some of the more vigorous clones were growing together so that greater spacings were necessary to maintain clonal purity. At the end of the three year period it was also obvious that many of the clones were of no value from the fiber standpoint because of low vigor, disease susceptibility and other undesirable traits. During 1954, ninety-eight of these poorest clones were discarded and the remaining 194 clones rearranged to give 6 foot spacings in all directions. To accomplish this, it was necessary to move certain seedling clumps. When this was done, the entire clump was lifted out of the ground and moved intact.

Ninety-three of the most vigorous clones have been planted in 6 x 9 foot plots. Fifty-seven of these are planted at the Hays Farm and 36 at Fort Lauderdale. The 57 clones planted at the Hays Farm were placed in cold tolerance tests at Belle Glade in June 1954.

Since the seedlings were transplanted to the field, leaf length measurements and plant number counts have been made at least once a year. In December of 1954, leaf length measurements were made. The increase in size and density of the clonal clump made it virtually impossible to obtain a reliable count of number of plants in 1954. Instead of number of plants, two diameter measurements of the clumps were taken. The average of the two diameters was taken as a measurement of spread of the clone. In 1953 samples of 3 leaves per clone were taken and retted for fiber determinations. In 1954 samples of 10

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Considerable disease developed in certain of the original clonal clumps at Fort Lauderdale during the winter of '53-'54. In January counts of number of diseased plants per clonal clump were made. The disease during the winter of '54-'55 has been very severe in all locations. Clones were severely injured by cold at Belle Glade, but the damage was minor at the Hays Farm and Fort Lauderdale. Since it is very difficult to distinguish between cold injury and disease, general overall injury readings were made at Fort Lauderdale and the Hays Farm in December and February and at Belle Glade in January and February. These readings were made using a rating scale of 0-5 with 0 being no injury and 5, very severe injury.

Data on length of leaf, number of plants, spread and percent fiber are presented in Table 3 for the most vigorous seedlings that are being increased in 6 x 9 foot plots. Leaf length in certain clones increased little or none at all in 1954. In other clones appreciable increases in length were made. Even among this selected group of seedlings, there is wide variation in length of leaf at this stage. Likewise, variation is great in number of plants in 1953 and spread measured in 1954.

Fiber percentage figures obtained for the two years agree reasonably well in spite of the small samples taken. It is apparent that at this stage, many of the clones are very low in fiber. A few others are much more promising from this standpoint. A truer picture of percent fiber and fiber yield potentialities cannot be obtained until larger samples can be taken and the clones are in replicated yield tests.

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Table 3. Length of leaf, number of plants, spread and percent fiber of S. trifasciata seedling clones. Data taken for original seedling clumps at Fort Lauderdale. (Sansevieria 54-1).

S. trifasciata Seedling Number	Length Longest Leaf, Inches 12/8/53	12/15/54	No. of Plants 12/8/53	Spread, Inches 12/15/54	Percent Fiber 8/12/53	12/27/54
tri S49-1	31	37	57	34	1.89	1.42
-2	20	20	24	26	1.73	—
-3	26	30	22	30	1.37	1.21
-4	18	19	29	36	0.74	0.61
-5	28	39	35	36	1.13	1.16
-7	22	35	54	35	1.60	2.14
-8	29	34	34	29	1.09	1.43
-9	19	27	27	33	1.54	1.33
-10	20	29	33	37	1.47	1.58
-11	17	25	27	30	1.28	1.46
-12	24	29	26	37	1.02	1.27
-13	25	26	25	33	1.42	1.34
-14	17	27	29	30	1.00	1.16
-15	18	18	30	23	1.10	—
-20	25	34	19	30	1.47	1.73
-21	17	18	25	32	0.82	0.80
-23	22	32	19	33	—	1.10
-25	26	32	28	38	1.10	1.53
-27	18	23	16	24	1.34	1.28
-41	16	20	32	29	1.05	1.05
-47	24	29	13	29	1.37	1.28
-49	17	22	34	28	0.96	0.80
tri S50-1	21	29	18	28	0.75	1.01
-7	17	23	16	30	0.66	1.14
-10	18	29	9	30	0.69	1.00
-11	19	23	21	33	0.62	0.66
-12	21	29	21	29	1.35	0.76
-14	18	24	22	27	1.21	0.74
-16	25	25	14	28	1.21	1.45
-18	15	16	13	26	1.02	—
-21	21	30	9	32	0.48	0.85
-27	21	31	12	28	1.05	—
-30	24	38	13	32	1.33	1.32
-32	18	30	6	31	0.69	0.59
-34	19	31	18	31	0.78	1.40
-35	16	24	16	36	1.17	0.86
-46	16	23	32	36	0.68	0.50
-47	16	22	15	32	0.74	0.81
-49	29	38	17	22	0.64	1.03
-51	30	35	17	40	0.53	0.99
-52	16	28	16	29	0.65	1.00
-61	23	32	6	29	0.72	0.93
-62	16	24	12	31	0.97	0.86
-63	29	35	18	34	0.86	1.02
-64	30	35	45	33	1.08	0.90

Table 3. Length of leaf, number of plants, spread and percent fiber of *B. trifasciata* seedling clones. Data taken on 8th original seedling clones as four lanuginia. (Equivalents 54-1).

B. trifasciata Seedling Number	Leaf, 12/6/53	Length 12/15/54	Longest 12/5/53	No. of Plants 12/15/54	Spread, Inches 8/23/53	Percent Fiber 12/27/54
trf 849-1	34	37	57	34	1.09	1.42
-2	30	30	54	36	1.73	—
-3	36	30	42	30	1.37	1.21
-4	18	19	29	36	0.74	0.61
-5	28	39	39	36	1.13	1.16
-7	32	35	54	39	1.60	1.34
-8	29	34	34	29	1.09	1.43
-9	19	27	27	33	1.54	1.32
-10	30	29	39	37	1.47	1.58
-11	17	25	27	30	1.38	1.46
-12	24	30	36	37	1.02	1.27
-13	29	26	25	33	1.42	1.34
-14	17	27	29	30	1.00	1.16
-15	18	18	30	33	1.30	—
-20	25	34	19	30	1.47	1.73
-21	17	18	25	32	0.82	0.80
-23	22	32	19	33	—	1.10
-25	26	32	28	38	1.30	1.39
-27	18	29	16	24	1.34	1.28
-41	16	20	32	29	1.05	1.09
-47	24	29	13	29	1.37	1.28
-49	17	22	34	28	0.96	0.80
trf 850-1	21	29	18	28	0.75	1.01
-7	17	23	16	30	0.86	1.14
-10	18	29	9	30	0.69	1.00
-11	19	29	21	33	0.62	0.66
-12	21	29	21	29	1.35	0.76
-14	18	24	22	27	1.23	0.74
-16	25	25	14	28	1.22	1.45
-18	15	16	13	26	1.02	—
-21	21	30	9	32	0.42	0.85
-27	21	31	12	28	1.05	—
-30	24	36	13	32	1.39	1.32
-32	18	30	6	31	0.99	0.89
-34	19	31	18	33	0.78	1.40
-35	16	24	14	36	1.17	0.86
-46	16	29	22	36	0.68	0.90
-47	16	22	15	38	0.74	0.81
-49	29	36	17	32	0.64	1.03
-51	30	35	17	40	0.83	0.99
-52	16	28	16	29	0.65	1.00
-61	23	39	6	29	0.78	0.93
-62	16	24	12	32	0.97	0.86
-63	29	35	18	34	0.86	1.02
-64	30	35	15	33	1.08	0.90

tri S50-66	26	29	35	29	0.83	0.92
-67	26	27	36	29	1.70	1.28
-69	18	18	30	34	1.08	0.84
-72	21	26	25	43	0.99	0.79
-73	25	25	22	40	1.44	1.33
-75	19	30	30	34	1.24	1.02
-79	17	24	44	54	0.87	0.90
-80	27	35	58	44	1.05	1.18
-82	25	27	36	35	1.02	0.54
-83	25	35	34	33	1.31	0.97
-84	25	29	31	33	0.74	1.07
-87	32	41	30	35	0.92	1.15
-90	28	38	36	39	1.33	1.09
-93	19	28	30	30	0.84	0.64
-99	23	28	27	23	1.33	1.46
-100	25	30	28	32	0.90	0.66
-101	18	24	32	35	0.94	1.08
-106	31	27	37	32	0.81	1.22
-108	24	30	23	41	0.96	0.90
-111	23	29	37	39	1.16	0.99
-113	23	31	29	34	1.46	0.78
-115	31	35	28	44	0.68	1.17
-117	36	36	19	40	0.81	1.12
-118	21	25	13	27	0.91	0.47
-120	20	26	26	40	0.98	1.15
-129	18	20	34	35	0.53	0.28
-134	17	19	47	31	0.78	0.35
-135	22	30	33	31	1.19	1.14
-136	18	24	30	41	0.56	0.50
-159	20	24	16	25	0.82	1.02
-160	16	24	42	28	0.70	0.55
-162	20	25	17	31	0.96	0.62
-163	22	23	18	31	0.75	0.94
-173	24	31	34	41	0.96	0.69
-175	22	33	33	30	1.04	1.00
-186	18	28	13	25	1.10	0.98
-191	16	18	19	20	0.85	—
-192	27	29	10	34	0.92	1.26
-206	21	29	12	20	0.66	0.73
-217	24	27	18	30	0.87	0.49
-219	16	22	30	30	0.67	0.51
-220	21	22	22	25	0.83	0.47
-231	24	27	17	34	0.61	0.86
-236	26	31	11	21	1.13	0.91
-238	19	21	19	28	0.98	0.58

Wt 950-65	25	20	35	29	0.83	0.92	
-67	26	27	36	39	1.70	1.28	
-69	18	18	30	34	1.08	0.84	
-72	21	26	25	43	0.99	0.79	
-73	25	25	22	40	1.44	1.33	
-75	19	30	30	34	1.24	1.08	
-79	17	24	44	34	0.87	0.90	
-80	27	35	38	44	1.09	1.18	
-82	25	37	36	38	1.08	0.84	
-83	25	35	34	38	1.34	0.97	
-84	25	29	31	39	0.74	1.07	
-87	32	43	30	35	0.98	1.18	
-90	28	38	36	39	1.33	1.09	
-93	19	28	30	30	0.84	0.64	
-99	23	28	27	33	1.33	1.46	
-100	25	30	28	32	0.90	0.66	
-101	18	24	32	38	0.94	1.08	
-106	31	27	37	36	0.83	1.22	
-108	24	30	29	41	0.96	0.90	
-111	29	29	37	39	1.26	0.99	
-113	29	31	29	34	1.46	0.78	
-115	31	32	28	44	0.62	1.17	
-117	36	36	19	40	0.81	1.12	
-118	23	25	13	27	0.91	0.47	
-120	20	26	26	40	0.98	1.15	
-129	18	20	34	36	0.59	0.28	
-134	17	19	17	32	0.78	0.35	
-135	22	30	23	31	1.19	1.14	
-136	18	24	30	41	0.86	0.90	
-139	20	24	16	29	0.82	1.08	
-160	16	24	42	38	0.70	0.95	
-162	20	25	17	31	0.96	0.62	
-163	22	23	18	31	0.75	0.94	
-173	24	31	34	41	0.96	0.69	
-175	22	33	33	30	1.04	1.00	
-186	18	28	13	25	1.10	0.98	
-191	16	18	19	20	0.85	—	
-192	27	29	10	34	0.92	1.26	
-206	21	28	18	20	0.66	0.73	
-217	24	27	18	30	0.87	0.49	
-219	16	22	36	30	0.87	0.52	
-220	21	22	22	25	0.83	0.47	
-231	24	27	17	34	0.81	0.86	
-236	26	21	11	21	1.13	0.93	
-238	19	21	19	28	0.98	0.58	

The disease and cold injury data are presented in Table 4. In general, clones low in percent diseased plants in '53-'54 were most resistant in '54-'55, and clones highest in percent diseased plants in '53-'54 were most susceptible in '54-'55. The agreement among locations for '54-'55 was also quite good. In each location the last rating in '54-'55 was most severe for most clones, indicating that as the winter progressed, the disease and cold damage increased.

Injury readings were made in field block plantings of trifasciata at Fort Lauderdale and the Hays Farm to serve as checks. S. trifasciata, S. laurentii and S. guineensis were placed in the cold tolerance tests at Belle Glade and readings made on these are also given. S. trifasciata at Fort Lauderdale was severely affected in both winters. A number of the trifasciata seedling clones were affected less than the parent clone. All three check clones were eventually severely injured at Belle Glade, but laurentii was more resistant than trifasciata and guineensis at the time of the first rating. Very few of the trifasciata seedling clones withstood the cold and disease well at Belle Glade.

The susceptibility of most of these clones to cold and disease is not too encouraging from the standpoint of developing a disease resistant cold tolerant selection of trifasciata. However, the ratings at Fort Lauderdale and the Hays Farm, where the injury was due mainly to disease, indicate that a few seedlings are definitely superior to the parental clone in disease resistance. Likewise, the January ratings at Belle Glade, where the injury was due mainly to cold, indicate certain seedling clones are superior to the check clones in cold tolerance. This superiority might be expected to hold up in areas where the temperature doesn't go too low and cold periods are

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Injury readings were made in field block plantings of *Trifoliata* at Fort Lauderdale and the Baya Farm to serve as checks. *T. trifoliata*, *T. laurentii* and *T. pubescens* were placed in the cold tolerance tests at Belle Glade and readings made on these are also given. *T. trifoliata* at Fort Lauderdale was severely affected in both winters. A number of the *trifoliata* seedling clones were affected less than the parent clone. All three check clones were eventually severely injured at Belle Glade, but *laurentii* was more resistant than *trifoliata* and *pubescens* at the time of the first rating. Very few of the *trifoliata* seedling clones withstood the cold and disease well at Belle Glade.

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Table 4. Disease-cold injury ratings taken on S. trifasciata seedling clones in 1954-55.

S. trifasciata Seedling Number	% Disease Plants Ft. Lauderdale 1/6/54	Cold-Disease Rating Ft. Lauderdale 12/15/54	Cold-Disease Rating Ft. Lauderdale 2/16/55	Cold-Disease Rating Lake Worth 12/17/54	Cold-Disease Rating Lake Worth 2/16/55	Cold-Disease Rating Belle Glade 1/6/55	Cold-Disease Rating Belle Glade 2/7/55
tri S49-1	5	1	2	1	1	2.0	4.0
-2	38	5	5	2	3	2.5	4.5
-3	50	4	4	2	2	4.0	4.5
-4	21	3	5	4	3	3.0	5.0
-5	20	4	4	4	4	2.5	4.0
-7	96	3	4	3	3	3.5	5.0
-8	12	3	3	3	3	2.0	2.5
-9	7	1	2	2	3	1.0	3.0
-10	24	4	5	1	2	2.0	3.5
-11	44	4	4	2	2	3.0	5.0
-12	40	3	4	3	4	3.5	5.0
-13	0	1	2	3	3	2.0	4.0
-14	45	4	5	5	5	4.0	4.5
-15	33	3	5	4	5	4.0	5.0
-20	47	3	3	1	2	2.0	4.0
-21	16	3	3	-	-	-	-
-23	11	2	2	-	-	-	-
-25	25	4	3	2	2	2.0	4.0
-27	12	3	3	1	3	2.0	4.0
-41	19	2	2	1	1	3.0	5.0
-47	38	3	3	1	2	2.0	4.0
-49	26	3	3	3	3	4.0	5.0
tri S50-1	28	2	2	2	2	1.5	3.5
-7	6	2	4	2	3	3.0	5.0
-10	4	2	3	2	2	2.0	4.5
-11	0	3	3	3	3	2.5	5.0
-12	28	2	2	2	2	2.5	5.0
-14	9	2	4	1	1	2.0	4.5

trl	850–16	5.0	4.5	3	3	4	21
	-18	5.0	4.0	2	2	5	23
	-21	4.5	3.5	1	1	1	0
	-27	5.0	4.0	1	1	5	25
	-30	2.5	1.0	2	2	3	8
	-32	5.0	3.5	2	2	5	38
	-34	5.0	4.0	1	1	3	0
	-35	5.0	3.0	2	2	1	6
	-46	5.0	4.0	1	1	4	0
	-47	5.0	5.0	2	2	3	13
	-49	2.0	1.0	1	1	1	6
	-51	3.0	2.0	2	2	2	24
	-52	4.0	2.0	2	2	2	6
	-61	3.0	2.5	1	1	1	0
	-62	2.5	0.5	1	1	1	17
	-63	4.5	2.5	2	2	2	22
	-64	4.5	3.5	1	1	3	9
	-66	4.0	1.5	1	1	1	3
	-67	5.0	4.5	4	4	4	17
	-69			1	1	3	13
	-72	4.0	1.5	2	2	2	32
	-73	5.0	4.5	2	2	2	9
	-75			1	1	1	3
	-79	4.0	1.5	2	2	4	28
	-80	4.5	2.0	2	2	3	22
	-82	3.5	1.5	1	1	3	19
	-83			1	1	1	9
	-84	3.5	2.0	2	2	4	3
	-87	5.0	3.0	2	2	3	27
	-90	5.0	3.5	1	1	3	27
	-93	3.0	1.0	2	2	3	40
	-99	4.5	3.5	2	2	2	22
	-100			1	1	1	7
	-101					3	12
	-106					1	3
	-108					3	17

| | | |

not too prolonged. The February ratings show that most of the clones found to be tolerant in January were eventually severely injured by the persistent cold weather experienced at Belle Glade in the winter of '54-'55, but even then a few clones were definitely superior to the check.

It is felt that some of these clones do show enough promise for testing beyond the observational type work done so far, and during 1955, plans are to place certain of these best seedling clones in a replicated yield test.

Perhaps the number of trifasciata seedling clones studied so far is too small to make any general conclusions about possibilities of extracting a superior disease resistant cold tolerant selection. And even though the number has been small, the work involved in the maintenance of the space planted clones has been considerable. It is believed that more progress could be made by dealing with much larger numbers of seedlings. These could be handled with little care if planted broadcast and allowed to grow together in a seedling block. Selection within the massed block could be made later following the development of disease and cold injury. To maintain absolute clonal purity, selections would have to be started from a single plant. In 1955, plans are to plant such a block of seedlings at Fort Lauderdale for disease selection and one at Belle Glade for cold tolerance selection.

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Figure 1. trifasciata seedling clone tri S-49-35, Fort Lauderdale, 2/17/55. Seed planted 1949, seedling transplanted to field March 1951. Note severe disease and cold injury.

Figure 2. trifasciata seedling clone tri S-50-53, Fort Lauderdale, 2/17/55. Seed planted March 1950, seedling transplanted to field April 1951. Note freedom from disease and cold injury.

Figure 1. *Trifoliolata* seedling clone trt 3-49-35, Fort Lauderdale, 2/17/55. Seed planted 1949, seedling transplanted to field March 1951. Note severe disease and cold injury.

Figure 2. *trifoliolata* seedling clone trt 3-50-53, Fort Lauderdale, 2/17/55. Seed planted March 1950, seedling transplanted to field April 1951. Note freedom from disease and cold injury.

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Figure 3. trifasciata seedling clone tri S-50-51, Fort Lauderdale, 2/17/55. Seed planted March 1950, seedling transplanted to field April 1951. Note severe disease injury at base of leaves.

Figure 4. trifasciata seedling clone tri S-50-75, Fort Lauderdale, 2/17/55. Seed planted March 1950, seedling transplanted to field April 1951. Note freedom from disease and cold injury.

Figure 3. *Trifoveolata* seedling clone tri 8-30-31, Fort Lauderdale, 2/17/55. Seed planted March 1950, seedling transplanted to field April 1951. Note severe disease injury at base of leaves.

Figure 4. *Trifoveolata* seedling clone tri 8-30-75, Fort Lauderdale, 2/17/55. Seed planted March 1950, seedling transplanted to field April 1951. Note freedom from disease and cold injury.

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Figure 5. trifasciata seedling clone tri S-50-106, Fort Lauderdale, 2/17/55. Seed planted March 1950, seedling transplanted to field April 1951. Note freedom from disease and cold injury.

Figure 5. *Trifoliate* seedling clone 1ml 3-50-106, Fort Lauderdale, 2/17/55. Seed planted March 1950, seedling transplanted to field April 1951. Note freedom from disease and cold injury.

INTERSPECIFIC AND INTERVARIETAL HYBRIDIZATION IN SANSEVIERIA

The results of interspecific and intervarietal crossing in sansevieria from 1951 through 1953 have been given in previous annual reports. During 1954, hybrids obtained in 1951 began to flower, and most of the crossing work was concerned with backcrosses of these hybrids to the trifasciata parent.

The results of crosses made during 1954 are given in Table 5. The backcross of three of the trifasciata x deserti hybrids to trifasciata was successful when trifasciata was the female parent. One hundred and seven backcross seedlings were obtained. No seed were set when the hybrid was used as the female. However, no special significance can be attached to this since few flowers were pollinated, and the cross was made under field conditions, whereas the reciprocal was made in the greenhouse. The trifasciata-deserti hybrids set a number of seed when selfed or allowed to open-pollinate under field conditions.

The two trifasciata-liberica hybrids flowered and reciprocal backcrosses to trifasciata were made. No seed were obtained. Several flower stalks were allowed to open-pollinate in the field, but failed to set seed. This sterility was expected since chromosome data obtained in 1951 indicated liberica to be a tetraploid in comparison with the diploid trifasciata.

The trifasciata-parva hybrids flowered but no backcrosses were made. Some seed were set on open-pollinated racemes, indicating fertility in this hybrid.

The variation within F_1 seedlings of trifasciata x deserti has shown the potentiality of selection within the F_1 and the desirability

INTERSPECIFIC AND INTERVARIETAL HYBRIDIZATION IN GARDENIELLA

The results of interspecific and intervarietal crossing in gardenias from 1951 through 1955 have been given in previous annual reports. During 1954, hybrids obtained in 1951 began to flower, and most of the crossing work was concerned with backcrosses of these hybrids to the triploids parent.

The results of crosses made during 1954 are given in Table 5. The backcross of three of the triploid x double hybrids to triploid was successful when triploid was the female parent. One hundred and seven backcross seedlings were obtained. No seed were set when the hybrid was used as the female. However, no special significance can be attached to this since few flowers were pollinated, and the cross was made under field conditions, whereas the reciprocal was made in the greenhouse. The triploid-double hybrids set a number of seed when selfed or allowed to open-pollinate under field conditions.

The two triploid-single hybrids flowered and reciprocal backcrosses to triploid were made. No seed were obtained. Several flower stalks were allowed to open-pollinate in the field, but failed to set seed. This sterility was expected since chromosome data obtained in 1951 indicated single to be a haploid in comparison with the diploid triploid.

The triploid-pure hybrids flowered but no backcrosses were made. Some seed were set on open-pollinated racemes, indicating fertility in this hybrid.

The variation within F1 seedlings of triploid x double has shown the potentiality of selection within the F1 and the desirability

Table 5. Results of sansevieria crosses made in 1954

Cross	No. Flowers Pollinated	No. Fruit Set	No. Seed Set	No. Hybrids Obtained
S. trifasciata x H51-13*	162	38	46	32
S. trifasciata x H51-14*	105	39	47	40
H51-14* x S. trifasciata	42	0	-	-
S. trifasciata x H51-15*	158	39	38	35
H51-2** x S. trifasciata	135	0	-	-
S. trifasciata x H51-2**	126	0	-	-
S. trifasciata x S. deserti	84	9	12	9
S. trifasciata x S. aethiopica	82	14	12	8
S. aethiopica x S. trifasciata	27	4	3	2

*trifasciata x deserti hybrids

**trifasciata x liberica hybrid

Table 5. Results of successful crosses made in 1954

Cross	No. Flowers Pollinated	No. Fruit Set	No. Seed Set	No. Hybrids Obtained
S. trifasciata x MSI-13*	162	38	46	32
S. trifasciata x MSI-14*	105	39	47	40
MSI-14* x S. trifasciata	42	0	-	-
S. trifasciata x MSI-15*	158	39	38	35
MSI-2** x S. trifasciata	135	0	-	-
S. trifasciata x MSI-2**	126	0	-	-
S. trifasciata x S. deserti	84	9	12	9
S. trifasciata x S. patitoyica	82	14	12	8
S. patitoyica x S. trifasciata	27	4	3	2

*trifasciata x deserti hybrids

**trifasciata x laurentia hybrid

for large numbers of hybrids. Therefore, more crosses of these two species were made, and nine hybrids were obtained.

One new interspecific cross was made in 1954. Hybrids were obtained from reciprocal crosses of trifasciata and aethopica. S. aethopica is very different from trifasciata and the hybrids should be interesting.

The desirable features of the trifasciata-deserti hybrids indicate the advisability of continued interspecific hybridization. From the theoretical and practical standpoint, any two species flowering together should be crossed. And it seems very desirable to cross trifasciata with the most divergent species, particularly the desert types. Clones maintained at the Hays Farm should eventually flower so that more interspecific hybridization can be done in the near future.

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The desirable features of the *trifasciata*-*deserti* hybrids indicate the advisability of continued interspecific hybridization. From the theoretical and practical standpoint, any two species flowering together should be crossed. And it seems very desirable to cross *trifasciata* with the most divergent species, particularly the desert types. Clones maintained at the Rego Farm should eventually flower so that more interspecific hybridization can be done in the near future.

HYBRID SEEDLING SELECTION

The 186 hybrid seedlings obtained in 1951 consisted of 2 hybrids of trifasciata x liberica, 7 of trifasciata x parva, 6 of trifasciata x deserti and 171 of trifasciata x laurentii. These were transplanted to the Hays Farm in September 1952. They were planted in three blocks with four foot spacings between seedlings. Some seedlings of parent species were included for comparison. During 1954, these seedling clones were reorganized. Five of the trifasciata-parva and 115 of the poorest trifasciata-laurentii clones were discarded. The remaining seedlings were arranged in a single block with 8 foot spacings between clones.

In December 1954, data were taken on length of leaf, spread and percent fiber. Samples of 10 leaves per clone were taken and decorticated for percent fiber determinations. These data are presented in Table 6. Data collected in 1953 on length of leaf, number of plants and percent fiber are given for comparison. Samples of 3 leaves per clone were retted for the fiber determinations in 1953.

In October of 1953, leaf material from two trifasciata-liberica, two trifasciata-parva, and six trifasciata-deserti hybrids was cut and a 6 x 9 foot plot of each planted at the Hays Farm. In October of 1954, a single plot of each of these hybrids was planted at Belle Glade. Data on percent dead cuttings and number of plants per cutting in the hybrid plots and in parent species at the Hays Farm are given in Table 6a.

The 10 hybrids mentioned in the preceeding paragraph were placed in the cold tolerance tests at Belle Glade in June of 1954. Disease and cold injury ratings were made in January and February as described

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Table 6. Length of leaf, number of plants, spread and percent fiber of sansevieria hybrid seedlings.

Hybrid seedling number	Length longest leaf, inches		No. of plants	Spread, inches	Percent fiber	
	12/7/53	12/15/54	12/7/53	12/15/54	11/10/53	12/27/54
S. trifasciata x S. liberica:						
H51-1	28	28	21	48	1.65	1.23
-2	23	24	23	44	1.09	1.20
S. trifasciata x S. parva:						
H51-5	20	15	41	22	1.12	1.56
-8	21	21	22	36	1.23	1.36
S. trifasciata x S. deserti:						
H51-10	47	48	10	26	0.99	1.06
-11	37	56	4	30	1.50	1.53
-12	43	45	7	28	1.73	1.38
-13	61	64	10	27	1.29	1.40
-14	54	55	3	22	1.44	1.43
-15	53	53	4	32	1.73	1.49
S. trifasciata x S. laurentii:						
H51-18	24	25	28	35	0.77	0.64
-20	25	28	34	34	0.55	0.71
-26	16	14	24	28	0.83	0.46
-30	29	29	26	24	1.00	—
-31	20	19	26	34	0.95	1.18
-32	29	33	33	42	0.77	1.23
-33	26	29	15	38	0.84	1.59
-34	29	31	21	34	1.01	1.75
-35	26	30	11	34	0.74	0.87
-39	22	28	14	39	0.59	0.89
-43	21	24	23	33	0.34	0.84
-45	24	28	16	32	0.62	1.00
-46	22	25	10	34	0.65	0.80
-51	27	38	15	39	0.68	0.94
-54	28	34	24	33	0.42	1.33
-58	23	26	14	33	1.04	0.54
-59	21	31	12	36	0.62	1.16
-61	25	31	16	34	1.19	1.09
-63	14	15	4	12	0.72	0.50
-67	19	26	14	33	0.79	1.05
-68	25	24	8	29	0.69	1.06
-70	18	15	20	22	0.74	1.96
-73	19	20	12	38	0.64	0.40
-75	22	27	12	35	1.24	1.04
-78	19	25	21	32	0.61	0.96

Table 6. Length of leaf, number of plants, spread and percent fiber of nonselecta hybrid seedlings.

Hybrid seedling number	Length longest leaf, 12/7/53	No. of plants 12/15/54	Spread, inches 12/15/54	Percent fiber 11/10/53 12/21/54
S. trifasciata x S. liberica:				
HS1-1	28	28	21	48	1.65	1.29
-2	29	24	29	44	1.09	1.20
S. trifasciata x S. parva:				
HS1-5	20	15	41	22	1.12	1.36
-6	21	21	22	36	1.23	1.36
S. trifasciata x S. deserti:				
HS1-10	47	48	10	26	0.99	1.06
-11	37	56	4	30	1.30	1.52
-12	43	45	7	28	1.73	1.38
-13	61	64	10	27	1.29	1.40
-14	54	55	3	22	1.44	1.43
-15	59	57	4	32	1.73	1.49
S. trifasciata x S. laurentii:				
HS1-18	24	25	28	35	0.77	0.64
-20	25	28	34	34	0.55	0.71
-26	16	14	24	28	0.83	0.46
-30	29	29	26	24	1.00	---
-31	20	19	26	34	0.95	1.18
-32	29	33	39	42	0.77	1.23
-33	26	29	15	38	0.84	1.59
-34	29	31	21	34	1.01	1.75
-35	26	30	11	34	0.74	0.87
-39	22	28	14	39	0.59	0.89
-43	23	24	23	33	0.34	0.84
-45	24	28	16	32	0.62	1.00
-46	22	29	30	34	0.65	0.80
-51	27	38	15	39	0.68	0.94
-54	28	24	24	33	0.42	1.33
-58	23	26	14	33	1.04	0.54
-59	21	31	12	36	0.62	1.16
-61	25	31	16	34	1.29	1.09
-63	14	15	4	18	0.72	0.50
-67	19	26	14	33	0.79	1.05
-68	25	24	8	29	0.69	1.06
-70	18	15	20	22	0.74	1.96
-73	19	20	12	38	0.64	0.40
-75	22	27	12	35	1.24	1.04
-78	19	25	21	32	0.64	0.96

H51-80	25	21	20	36	0.82	0.92
-85	22	24	26	40	0.94	1.07
-87	9	11	12	24	0.99	0.67
-88	22	23	14	33	0.94	1.35
-93	16	19	36	37	0.70	0.80
-97	20	30	13	24	0.64	0.89
-108	26	24	19	38	0.65	0.97
-112	25	36	17	36	1.02	1.39
-115	25	31	14	35	1.25	1.61
-128	19	15	36	30	0.64	2.74
-131	20	28	21	40	1.28	1.00
-132	27	29	14	32	0.58	1.02
-136	25	26	14	33	0.55	1.24
-138	26	32	17	39	0.81	1.29
-143	28	34	23	36	1.26	1.29
-144	22	26	15	41	0.68	1.14
-147	23	32	14	32	0.81	1.08
-148	23	30	13	30	0.81	1.10
-149	16	22	17	33	0.66	0.64
-151	25	30	34	32	1.09	0.92
-152	24	32	13	38	1.03	1.19
-154	19	26	14	36	0.69	0.53
-155	22	31	16	32	1.02	1.33
-159	20	23	13	32	0.48	0.96
-164	22	20	30	37	0.48	0.63
-168	19	25	17	33	1.21	1.13
-175	19	19	32	32	0.64	1.10
-176	22	22	21	36	0.77	1.06
-180	20	31	13	26	1.12	0.91

851-80	25	21	20	36	0.82	0.92	
-85	22	24	26	40	0.94	1.07	
-87	9	11	12	24	0.99	0.67	
-88	22	23	14	33	0.94	1.35	
-93	16	19	36	37	0.70	0.80	
-97	20	30	13	24	0.64	0.89	
-108	28	24	19	38	0.65	0.97	
-112	25	36	17	36	1.02	1.39	
-119	25	31	14	35	1.25	1.61	
-128	19	19	36	30	0.64	2.74	
-131	29	28	21	40	1.28	1.00	
-132	27	29	14	32	0.98	1.02	
-136	25	26	14	33	0.95	1.24	
-138	26	32	17	39	0.81	1.29	
-143	28	34	23	36	1.26	1.29	
-144	22	26	15	41	0.68	1.14	
-147	29	32	14	32	0.81	1.08	
-148	23	30	13	30	0.83	1.10	
-149	16	22	17	33	0.66	0.64	
-151	25	30	34	32	1.09	0.92	
-152	24	32	13	38	1.03	1.19	
-154	19	26	14	36	0.69	0.53	
-155	22	31	16	32	1.02	1.33	
-159	20	23	13	34	0.48	0.96	
-164	22	20	30	37	0.48	0.63	
-166	19	25	17	33	1.21	1.13	
-175	19	19	32	32	0.64	1.10	
-175	22	22	21	36	0.77	1.06	
-190	20	31	13	26	1.12	0.91	

Table 6a. Percent dead cuttings and number of plants per cutting in sansevieria hybrids and parents (Hays Farm)

Hybrid or Species	Percent Dead Cuttings	No. Plants Per Cutting
trifasciata x liberica:		
H51-1	2	2.4
-2	9	3.2
trifasciata x parva:		
H51-5	12	1.9
-8	12	1.6
trifasciata x deserti:		
H51-10	19	3.9
-11	2	2.8
-12	2	3.5
-13	10	2.9
-14	15	1.6
-15	8	2.3
S. trifasciata	5	2.5
S. parva	5	3.0
S. liberica	82	.1
S. deserti	8	1.6

Table 6a. Percent dead cuttings and number of plants per cutting in sunroviella hybrids and parents (Three Years)

Hybrid or Species	Percent Dead Cuttings	No. Plants Per Cutting
triflagellata x liberica:		
HSJ-1	2	2.4
-2	9	3.2
triflagellata x perra:		
HSJ-5	12	1.9
-8	12	1.6
triflagellata x deserti:		
HSJ-10	19	3.9
-11	2	2.8
-12	2	3.3
-13	10	2.9
-14	15	1.6
-15	8	2.3
S. triflagellata	5	2.5
S. perra	5	3.0
S. liberica	82	.3
S. deserti	6	1.6

for the trifasciata seedling clones in a preceeding section. Ratings were also made at the Hays Farm in December and February on these 10 hybrids and the trifasciata-laurentii hybrids. These disease and cold injury data are given in Table 7.

The two trifasciata-liberica hybrids increased little in height during the year, and apparently the short leaf character of liberica is strongly dominant in the F_1. These hybrids do have the ability to spread out and give a large number of densely spaced plants. The percent fiber in these hybrids is disappointing, being much lower than had been expected. They are also quite susceptible to disease and cold damage, but can be propagated as readily from leaf cuttings as trifasciata. A backcross to trifasciata might be expected to give more desirable height and fiber type, but as discussed in a preceeding section, the hybrids are apparently sterile.

The trifasciata-parva hybrids are of no value for fiber purposes, and thus only two were retained. In addition to having a short narrow leaf, they are very susceptible to disease and cold injury.

Most of the growth in the trifasciata-deserti hybrids during 1954 was in the production of new plants. Except for H51-11, the height of the plants increased little during the year. Length of longest leaf ranged from 45 to 64 inches. These hybrids average around 1.4 percent decorticated fiber. H51-10 appears to be lower in percent fiber than the other five hybrids. The trifasciata-deserti hybrids give a good number of plants per leaf cutting, so there is no problem in propagation in this manner. These hybrids also appear to be definitely superior in disease resistance and cold injury. Very little disease has been found on these hybrids, and injury was due mainly to cold.

for the trifoveolata seedling clones in a preceding section. Tests were also made at the Mays Farm in December and February on these 10 hybrids and the trifoveolata-laurentii hybrids. These disease and cold injury data are given in Table 7.

The two trifoveolata-litoralis hybrids increased little in height during the year, and apparently the short leaf character of litoralis is strongly dominant in the F_1. These hybrids do have the ability to spread out and give a large number of densely spaced plants. The percent fiber in these hybrids is disappointing, being much lower than had been expected. They are also quite susceptible to disease and cold damage, but can be propagated as readily from leaf cuttings as trifoveolata. A tendency to trifoveolata might be expected to give more desirable height and fiber type, but as discussed in a preceding section, the hybrids are apparently sterile.

The trifoveolata-pura hybrids are of no value for fiber purposes, and thus only two were retained. In addition to having a short narrow leaf, they are very susceptible to disease and cold injury.

Most of the growth in the trifoveolata-deserti hybrids during 1954 was in the production of new plants. Except for M31-11, the height of the plants increased little during the year. Length of longest leaf ranged from 45 to 64 inches. These hybrids average around 1.4 percent decorticated fiber. M31-10 appears to be lower in percent fiber than the other five hybrids. The trifoveolata-deserti hybrids give a good number of plants per leaf cutting, so there is no problem in propagation in this manner. These hybrids also appear to be definitely superior in disease resistance and cold injury. Very little disease has been found on these hybrids, and injury was due mainly to cold.

Table 7. Disease-cold injury ratings taken on sansevieria hybrid seedling clones in 1954-55.

Hybrid Seedling Number	Cold-Disease Rating Lake Worth 12/15/54	Cold-Disease Rating Lake Worth 2/16/55	Cold-Disease Rating Belle Glade 1/6/55	Cold-Disease Rating Belle Glade 2/7/55
S. trifasciata x S. liberica:				
H51-1	3	3	3.0	4.5
-2	1	3	2.5	4.0
S. trifasciata x S. parva:				
H51-5	4	5	4.5	5.0
-8	3	4	4.0	5.0
S. trifasciata x S. deserti				
H51-10	1	2	1.5	1.5
-11	0	1	0.5	1.5
-12	1	1	0.0	1.0
-13	2	2	0.5	1.5
-14	0	0	1.0	1.5
-15	1	2	1.0	2.0
S. trifasciata x S. laurentii				
H51-18	1	1		
-20	2	3		
-26	1	1		
-30	1	2		
-31	2	2		
-32	0	3		
-33	4	4		
-34	2	2		
-35	2	2		
-39	4	4		
-43	2	2		
-45	2	3		
-46	3	1		
-51	3	4		
-54	0	0		
-58	2	2		
-59	1	1		
-61	2	2		
-63	2	2		
-67	1	3		
-68	1	3		
-70	3	2		
-73	1	2		
-75	1	2		
-78	1	1		
-80	1	2		
-85	2	3		
-87	1	1		

Table 7. Disease-cold injury ratings taken on sunnovelera hybrid seedling clones in 1954-55.

Hybrid Seedling Number	Cold-Disease Rating Lake North 12/15/54	3/15/55	Cold-Disease Rating Delta Glade 1/6/55	2/1/55
S. trifoveolata x S. liberica:				
H51-1	3	3	3.0	4.5
-2	1	3	2.5	4.0
S. trifoveolata x S. perva:				
H51-5	4	5	4.5	5.0
-8	3	4	4.0	5.0
S. trifoveolata x S. decorti				
H51-10	1	2	1.5	1.5
-11	0	1	0.5	1.5
-12	1	1	0.0	1.0
-13	2	2	0.5	1.5
-14	0	0	1.0	1.5
-15	1	2	1.0	2.0
S. trifoveolata x S. laurentii				
H51-18	1	1		
-20	2	3		
-26	1	1		
-30	1	2		
-31	2	2		
-32	0	3		
-33	4	4		
-34	2	2		
-35	2	2		
-39	4	4		
-43	2	3		
-45	2	3		
-46	3	1		
-51	3	4		
-54	0	0		
-58	2	2		
-59	1	1		
-61	2	2		
-63	2	2		
-67	1	3		
-68	1	3		
-70	3	2		
-73	1	2		
-75	1	2		
-78	1	1		
-80	1	2		
-85	2	3		
-87	1	1		

H51-88	3	3		
-93	1	1		
-97	1	1		
-108	1	1		
-112	3	2		
-115	2	3		
-128	2	3		
-131	1	3		
-132	1	1		
-136	2	2		
-138	1	2		
-143	1	3		
-144	1	2		
-147	2	3		
-148	3	3		
-149	1	1		
-151	3	2		
-152	3	4		
-154	2	1		
-155	1	2		
-159	2	2		
-164	1	1		
-168	2	3		
-175	3	1		
-176	1	2		
-180	1	2		
S. trifasciata	2	2	2.6	4.9
S. laurentii	1	1	1.8	4.0
S. guineensis	2	2	4.4	5.0
S. parva	3	3	3.0	5.0
S. deserti	0	0	0	0
S. liberica	3	3	4.5	5.0

M31-88	3		3		
-93	1		1		
-97	1		1		
-108	1		1		
-112	3		3		
-113	3		3		
-128	3		3		
-131	1		1		
-132	1		1		
-136	2		2		
-138	2		2		
-143	1		1		
-144	2		2		
-147	2		2		
-148	3		3		
-149	1		1		
-151	3		3		
-152	3		3		
-154	2		2		
-155	1		1		
-159	2		2		
-164	1		1		
-168	2		2		
-175	1		1		
-176	1		1		
-180	1		1		
B. brilliantaisa	2	2		2.6	4.9
B. jamesonii	1	1		1.8	4.0
B. guineensis	2	2		4.4	5.0
B. perrs	3	3		3.0	5.0
B. dessertii	0	0		0	0
B. liliorlaa	3	3		4.5	5.0

Apparently the cold tolerance comes from the deserti parent, since this species was free from injury in the cold tolerance tests.

Wide variation was observed among the trifasciata-laurentii hybrids, and is similar to that observed in the trifasciata seedling clones. It is important to place these hybrids in cold tolerance tests at Belle Glade during 1955.

Quality tests were run on the fiber samples obtained from the trifasciata-liberica, trifasciata-parva, and the trifasciata-deserti hybrids. Tests were made on samples of trifasciata, deserti and liberica harvested at the same time. Strength was measured by drawing two bundles and making five 1/2 inch breaks per bundle. Two bundles with two breaks per bundle were taken for shear. Two wear and flex measurements were made for each hybrid. In some samples sufficient fiber was not obtained to make all these tests. The quality data are given in Table 7a. Though these data are limited and variable, it appears that the trifasciata-liberica and the trifasciata-deserti hybrids are equal to trifasciata in quality of fiber.

The trifasciata-deserti hybrids are the most promising of the hybrids made so far. Certainly enough data is not available at this time to predict their potentialities for fiber. The more rapid rate of growth and ability to produce fiber leaves without the establishment of a dense stand is perhaps the most important advantage of the hybrids. This should reduce the time required to obtain a crop of fiber leaves, but just how much reduction must be determined by further experimentation. These hybrids can be readily propagated by leaf cuttings and the disease and cold resistance are important advantages.

From limited data taken so far, it appears that the hybrids are a little low in percent fiber. Actual yield potentialities are not

Apparently the cold tolerance comes from the *deserti* parent, since this species was free from injury in the cold tolerance tests.

Wide variation was observed among the *trifasciata-laurentii* hybrids, and is similar to that observed in the *trifasciata* seedling clones. It is important to place these hybrids in cold tolerance tests at Belle Glade during 1955.

Quality tests were run on the fiber samples obtained from the *trifasciata-liberica*, *trifasciata-gurva*, and the *trifasciata-deserti* hybrids. Tests were made on samples of *trifasciata*, *deserti* and *liberica* harvested at the same time. Strength was measured by drawing two bundles and making five 1/2 inch breaks per bundle. Two bundles with two breaks per bundle were taken for sheer. Two weer and flax measurements were made for each hybrid. In some samples sufficient fiber was not obtained to make all these tests. The quality data are given in Table 6a. Though these data are limited and variable, it appears that the *trifasciata-liberica* and the *trifasciata-deserti* hybrids are equal to *trifasciata* in quality of fiber.

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From limited data taken so far, it appears that the hybrids are a little low in percent fiber. Actual yield potentialities are not

Table 7a. Mean strength, shear, wear and flex measurements of sansevieria hybrids and parents.

Hybrid or Species	1000 lbs. per sq. in. Strength	Shear	Cycles to Failure Wear	Flex
trifasciata x liberica:				
H51-1	50.9	14.1	1819	9108
H51-2	45.0	14.1	—	5364
trifasciata x deserti:				
H51-10	57.3	13.5	639	4429
-11	53.4	14.3	1114	4056
-12	55.1	13.1	666	2992
-13	51.4	12.2	932	3211
-14	53.2	11.8	760	2984
-15	49.6	11.0	1661	3352
S. liberica	46.6	13.7	966	4479
S. trifasciata	47.0	11.0	1099	2163
S. deserti	48.0	13.8	983	4106

Table 6. Mean strength, shear, wear and flax measurements of sunnevarda hybrids and parents.

Hybrid or Species	Strength 1000 lbs. per sq. in.	Shear	Wear	Cycles to Failure Flex
trifasciata x liberica:				
HSL-1	30.9	14.1	1819	9108
HSL-2	45.0	14.1	—	5964
trifasciata x deserti:				
HSL-10	57.3	13.5	639	4129
-11	53.4	16.5	1114	4056
-12	55.1	13.1	666	2992
-13	51.4	12.2	932	3211
-14	53.2	11.8	760	2984
-15	49.6	11.0	1661	3352
3. liberica	45.6	13.7	966	4479
5. trifasciata	47.0	11.0	1099	2163
5. deserti	43.0	13.8	983	1286

known, but it is believed the hybrids will compare favorably with trifasciata. It seems that the long semi-round leaves could be handled mechanically without too much difficulty. Information on growth following cutting is desired. In 1954, most of the hybrids produced a good number of plants to indicate fair stooling ability. In quality the hybrids compare favorably with trifasciata.

The most important problem in relation to these hybrids is to place them in replicated yield trials so that questions regarding yield can be answered. Sufficient planting stock of these 6 hybrids will be available in 1955 for yield trials. The 23 trifasciata-deserti hybrids obtained in 1952 and the 9 obtained in 1954 must be pushed as rapidly as possible and eventually tested. Likewise, the 107 back-cross seedlings to trifasciata and F_2 seedlings merit special attention. The selection possibilities within these two groups should be tremendous.

The 23 trifasciata-deserti hybrids, the 6 laurentii-parva hybrids and the parva-deserti obtained in 1952 were transplanted tothe Hays Farm in September 1953. During 1954, these hybrids made good growth. In the trifasciata-deserti hybrids, considerable variation in number of plants, length of leaf, disease and cold injury was observed. The 143 trifasciata-laurentii hybrids obtained in 1952 were trans-planted to the field at Belle Glade during the year. Most of these were severely affected by disease and cold, but a few of them appear superior to trifasciata.

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The most important problem in relation to these hybrids is to place them in replicated yield trials so that questions regarding yield can be answered. Sufficient planting stock of these 6 hybrids will be available in 1955 for yield trials. The 23 *trifasciata-decorti* hybrids obtained in 1952 and the 9 obtained in 1954 must be pushed as rapidly as possible and eventually tested. Likewise, the 107 backcross seedlings to *trifasciata* and 75 seedlings merit special attention. The relation possibilities within these two groups should be tremendous.

The 23 *trifasciata-decorti* hybrids, the 6 *laurentii-perrs* hybrids and the *perrs-decorti* obtained in 1952 were transplanted to the flats in September 1953. During 1954, these hybrids made good growth. In the *trifasciata-decorti* hybrids, considerable variation in number of plants, length of leaf, disease and cold injury was observed. The 143 *trifasciata-laurentii* hybrids obtained in 1952 were transplanted to the field at Belle Glade during the year. Most of these were severely affected by disease and cold, but a few of them appear superior to *trifasciata*.

Figure 6. Sansevieria hybrid H51-13 (trifasciata x deserti), Hays Farm, 2/16/55. Seed planted July 1951, seedling transplanted to field September 1952.

Figure 7. Sansevieria hybrid H51-12 (trifasciata x deserti), Hays Farm, 2/16/55. Established from leaf cuttings planted October 1953. Note dense stand of plants.

Figure 6. Sansevieria hybrid W31-13 (trifasciata x deserti). Dayo Farm, 2/16/55. Seed planted July 1951, seedling transplanted to field September 1952.

Figure 7. Sansevieria hybrid W31-12 (trifasciata x deserti). Dayo Farm, 2/16/55. Established from leaf cuttings planted October 1953. Note dense stand of plants.

3
2
1
6

3
2
1
7

Figure 8. Sansevieria hybrid H51-2 (*trifasciata* x *liberica*), Hays Farm, 2/16/55. Seed planted July 1951, seedlings transplanted to field September 1952.

Figure 9. Sansevieria hybrid H51-1 (*trifasciata* x *liberica*), Hays Farm, 2/16/55. Established from leaf cuttings planted October 1953. Note dense stand of plants.

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Figure 10. Sansevieria hybrid H51-5 (*trifasciata* x *parva*), Hays Farm, 2/16/55. Seed planted July 1951, seedling transplanted to field September 1952.

Figure 10. Sansevieria hybrid M31-5 (*trifasciata* x *parva*). Days Ross. 8/15/55. Seed planted July 1951, seedling transplanted to field September 1952.

Figure 11. Sansevieria hybrid H51-54 (trifasciata x laurentii), Hays Farm, 2/16/55. Seed planted July 1951, seedling transplanted to field September 1952. Note freedom from disease and cold injury.

Figure 12. Sansevieria hybrid H51-39 (trifasciata x laurentii), Hays Farm, 2/16/55. Seed planted July 1951, seedling transplanted to field September 1952. Note disease and cold injury to tips of leaves.

Figure 11. Sansevieria hybrid M51-54 (*trifasciata* x *laurentii*), Haye Farm, 2/16/55. Seed planted July 1951, seedling transplanted to field September 1952. Note freedom from disease and cold injury.

Figure 12. Sansevieria hybrid M51-39 (*trifasciata* x *laurentii*), Haye Farm, 2/16/55. Seed planted July 1951, seedling transplanted to field September 1952. Note disease and cold injury to tips of leaves.

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COUNTY PRISON FARM SANSEVIERIA PROJECT

Approximately seven acres of S. trifasciata were planted in the spring of 1954 at the Palm Beach County prison farm located about 8 miles west of Lake Worth. Planting stock was obtained from the Hays Farm and Belle Glade. Better quality leaves were obtained at the Hays Farm, and a better stand of plants was obtained in blocks planted from this stock. Some assistance was given the agricultural engineers in the preparation of planting stock and in the actual planting operation. Two laborers were provided by the Cotton Section for making cuttings at the Hays Farm and one laborer was furnished to help in the planting. A general summary of the first year's planting and times involved in the various operations can be found in the 1953 annual report submitted by Mr. Byrom.

The purpose of this section of this report is to summarize the work performed by Cotton Section personnel in the maintenance and care of the planting during 1954. A chemical weed control and fertilizer rate and time of application schedule was set up based on experimental results obtained at this station. Results obtained by Dr. Gangstad indicated that at least three 6-pound (active) applications of CMU per acre would be required for the control of weeds in sansevieria on the sandy soils of the east coast. Therefore, the chemical weed control application schedule was set up on this basis with times of application to fall around November 1, April 1 and July 15. Best results have been obtained with CMU when weeds are actively growing so a fall application after heavy rains are over and before cold weather arrives seemed desirable. Weed growth during the cool dry winter months is somewhat limited, and another application should not be needed before

COUNTY PRISON FARM SARCOPTERIA PROJECT

Approximately seven acres of S. trifoliata were planted in the spring of 1954 at the Palm Beach County prison farm located about 8 miles west of Lake Worth. Planting stock was obtained from the Hays Farm and Della Glade. Better quality leaves were obtained at the Hays Farm, and a better stand of plants was obtained in blocks planted from this stock. Some assistance was given the agricultural engineers in the preparation of planting stock and in the actual planting operation. Two laborers were provided by the Cotton Section for making cuttings at the Hays Farm and one laborer was furnished to help in the planting. A general summary of the first year's planting and times involved in the various operations can be found in the 1953 annual report submitted by Mr. Byrom.

The purpose of this section of this report is to summarize the work performed by Cotton Section personnel in the maintenance and care of the planting during 1954. A chemical weed control and fertilizer rate and time of application schedule was set up based on experimental results obtained at this station. Results obtained by Dr. Dempsey indicated that at least three 6-pound (active) applications of DMU per acre would be required for the control of weeds in sarcoptera on the sandy soils of the east coast. Therefore, the chemical weed control application schedule was set up on this basis with times of application to fall around November 1, April 1 and July 15. Best results have been obtained with DMU when weeds are actively growing so a full application after heavy rains are over and before cold weather arrives seemed desirable. Weed growth during the cool dry winter months is somewhat limited, and another application should not be needed before

April or later. A third application around mid-July would be needed to control the summer growth of weeds.

The first application of CMU to the 7 acres was made in late June. Some difficulties were experienced in the first operation. In experimental plots, CMU has been applied at high gallonage rates; approximately 80 gallons of water per acre. An attempt was made to cut this to 18 gallons per acre, but with this concentrated mixture, nozzle stoppage was frequent due to the 100 mesh screens, small openings of the nozzles and inability to agitate the solution in the tank. Increasing the pressure from the 40 pounds used to deliver the 18 gallons per acre did not increase the gallonage appreciably, and at the higher pressure, there was excessive drift. A double application of the chemical was made to apply sufficient CMU per acre.

Kill of weeds following this application was quite good, and would have been much better if heavy rains following application had not occurred. Some of the worst spots were sprayed by hand in July.

Quite a few weeds were present in the planting by November, and another application was needed. But it was delayed until mid-January pending the arrival of CMU. Nozzles with larger openings and 50 mesh screens were ordered, and an agitator was added to the drum by the engineers. These changes eliminated most of the stoppage due to CMU, but some trouble was caused by rust and trash accumulating in the tank. The gallonage was increased to about 40 per acre at 40 pounds pressure, and about 6 pounds of CMU was applied in one application. At this time, (2-15-55) there is some effect from this application, but results are slow in showing up due to cool weather. In any event, it appears that another application will be needed in April.

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Information on dates, rates, man hours and costs for the application of the GMU are contained in Table 7b. It is believed that the man hours involved in the operation can eventually be cut considerably from the requirement in the last spraying.

Fertilizer experiments conducted at this station have shown the need for about 150-100-150 units of N-P-K per acre per year for good growth of sansevieria on the sandy soils of the east coast. These experiments have further shown the desirability of using an organic source of N and 3-4 applications per year to avoid excessive leaching. Therefore, a tentative schedule was set up to apply 150-100-150 units of N-P-K per acre per year using Nugreen (44% N), triple superphosphate (45% P_2O_5), and muriate of potash (60% K). N was to be split in 3 applications around November 1, April 1 and July 15. Leaching of K can be excessive too, but the number of applications was reduced to 2 per year to fall around November 1 and July 15. All the P was to be applied in one application around November 1. Minor elements were to be applied about November 1 as follows: 25 pounds $CuSO_4$, 25 pounds $MnSO_4$, 10 pounds $ZnSO_4$ and 5 pounds Borax per acre per year.

Before the above schedule was worked out, a general aplication of N-P-K was made in August. When more than one fertilizer element was to be applied at one time, a mixture of all nutrients to be applied in a single application was planned. However, in this first application, the mixture soon became very wet due to the deliquescent nature of the Nugreen when mixed with the other materials. The wet mixture accumulated in the fertilizer tubes, causing uneven application, and eventually the tubes became plugged with the wet fertilizer. This

Information on dates, rates, man hours and costs for the applications of the OMU are contained in Table 7b. It is believed that the man hours involved in the operation can eventually be cut considerably from the requirement in the last spraying.

Fertilizer experiments conducted at this station have shown the need for about 150-100-150 units of N-P-K per acre per year for good growth of asparagus on the sandy soils of the east coast. These experiments have further shown the desirability of using an organic source of N and 3-4 applications per year to avoid excessive leaching. Therefore, a tentative schedule was set up to apply 150-100-150 units of N-P-K per acre per year using Nugreen (44% N), triple superphosphate (45% P_2O_5), and muriate of potash (60% K). N was to be split in 3 applications around November 1, April 1 and July 15. Leaching of K can be excessive too, but the number of applications was reduced to 2 per year to fall around November 1 and July 15. All the P was to be applied in one application around November 1. Minor elements were to be applied about November 1 as follows: 25 pounds $CuSO_4$, 25 pounds $MnSO_4$, 10 pounds $ZnSO_4$ and 5 pounds Borax per acre per year.

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Table 7b. Data, rates, costs and man hours for the application of CMU to the sansevieria at the county prison farm

Date of Application	Lbs. Applied per Acre	CMU Cost per Acre	Man Hours per Acre*
6/22/54	5.2	$ 14.39	5.1
7/19/54	Spot Application	5.71	5.1
1/17/55	6.4	19.20	4.4

*Time actually spent at prison farm carrying out operation.

Table 7b. Data, rates, costs and man hours for the application of DBN to the accelerata at the county prison farm

Date of Application	Lbs. Applied per Acre	DBN Cost per Acre	Man Hours per Acre*
6/22/54	5.2	$ 14.39	5.3
7/19/54	Spot Application	5.72	5.3
1/27/55	6.4	19.20	4.4

*Time actually spent at prison farm carrying out operation.

mixture was applied to about 2/3 of the planting. Nitrate of potash or Nugreen was applied to the remainder of the planting. It was obvious that Nugreen could not be mixed with other materials and applied by means of the fertilizer equipment.

In November 1/3 of the yearly amount of N, all the yearly amount of P and minor elements and 1/2 the yearly requirement of K was applied. In this application, the Nugreen was applied singly and all the other elements were applied as a mixture.

Information on dates, rates, man hours and costs for the fertilizing operation are given in Table 7G. The number of man hours can probably be reduced eventually.

The engineers have been most cooperative in mounting the spray and fertilizer equipment to the tractor before each application of CMU or fertilizer. They have also been of great assistance in the modification of this equipment to fit our needs and in helping work out problems encountered in the application of CMU and fertilizer.

Plans for 1955 call for the planting of 13 additional acres. At this time the land is about ready for planting. The application of CMU and fertilizer will be continued on the same schedule as discussed above. To make three 6-pound (active) applications of CMU per acre per year will cost approximately $72.00. To apply 150-100-150 units respectively of N-P-K + minor elements per acre per year will cost about $42.00. It appears that the minimum costs for CMU and fertilizer per acre per year will be about $114.00.

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Information on dates, rates, man hours and costs for the fertilizing operation are given in Table 7C. The number of man hours can probably be reduced eventually.

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Table 7C. Dates, rates, costs and man hours for the application of N-P-K to the sansevieria at the county prison farm

Date of Application	Units of N-P-K Applied per Acre	Fertilizer Cost per Acre	Man Hours per Acre*
8/4/54	50-33-50	$ 17.27	5.1
11/23/54	50-100-75 + M. E.	22.70	3.4

*Time actually spent at prison farm carrying out operation.

Table 76. Rates, rates, costs and man hours for the application of H-P-K to the secondvista at the county union fare

Date of Application	Units of H-P-K Applied per Acre	Fertilizer Cost per Acre	Man Hours per Acre*
8/4/54	50-33-50	$ 17.27	5.1
11/23/54	50-100-75 + M. E.	22.70	9.4

*Time actually spent at prison farm carrying out operation.

K E N A F

INTRODUTION

Three nursery plantings were made in 1954. The spring nursery was planted February 11. Normally this should be early enough to give good seed production, but unseasonably cool weather delayed growth during the flower inducing short days, and no seed were obtained in the spring. The plants were left standing through the summer and a fall crop of seed was harvested. This nursery provided material for Dr. Summers to field test for racial specialization of C. hibisci. A second nursery was planted at Fort Lauderdale in June for the purpose of testing lines for resistance to the races of C. hibisci. The regular fall nursery was planted September 9-10 at the Hays Farm. Growth and seed production was very good. Scattered frost occurred on December 21 and 22 before many of the capsules were ripe, but very little damage resulted.

Two strain tests were conducted at Belle Glade. Twenty-three Salvadorian lines and 2 check varieties were compared in a 5 x 5 lattice square. Sixty-two Salvadorian lines and the same checks were compared in an 8 x 8 simple lattice.

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REPORT

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Seed increase plots of certain lines were planted in isolation during the spring and fall. An increase planting of the Salvadorian variety was made at the Hays Farm.

SELECTION FOR RESISTANCE TO C. HIBISCI

The high degree of resistance to C. hibisci of many Salvadorian lines began to break down in the 1953 fall nursery. Lines that had been HR throughout all previous generations continued to give a HR reaction following inoculation, but the disease developed later in the season in certain of these lines.

In the spring of 1954, Summers[1] demonstrated the existence of three physiologic races of the fungus using a number of isolates and various lines of kenaf selected at this station. The original isolate of the fungus that had been used in selecting for resistance prior to 1954 was designated race 3. It was found that certain lines HR to this race were CS to an isolate designated race 2. Another isolate designated race 1 was found to be very similar to race 3 except for minor pathogenicity differences on 3 of the 15 lines tested. The sudden breakdown of HR lines late in the season in the 1953 fall nursery was due apparently to natural infection of race 2.

Since all selection for resistance prior to 1954 was based on inoculations with race 3, it became evident that all lines would have to be tested for reaction to races 1 and 2, particularly 2, because of the major difference in pathogenicity of races 2 and 3. Therefore, a disease nursery was planted at Fort Lauderdale in June 1954 for the purpose of testing all lines for reaction to races 2 and 3. A total of 639 selfed progenies in all lines carried in the breeding program were planted. Two rows of each progeny were planted; one

[1] Summers, T. E. Physiologic specialization of Colletotrichum hibisci Poll. on kenaf. Plant Disease Reporter. 38: 483-486. 1954.

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In the spring of 1954, Summers[1] demonstrated the existence of three physiologic races of the fungus using a number of isolates and various lines of beans selected at this station. The original isolate of the fungus that had been used in selecting for resistance prior to 1954 was designated race 1. It was found that certain lines MR to this race were CS to an isolate designated race 2. Another isolate designated race 3 was found to be very similar to race 2 except for minor pathogenicity differences on 3 of the 15 lines tested. The sudden breakdown of HR lines late in the season in the 1953 fall nursery was due apparently to natural infection of race 2.

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[1] Summers, T. E. Physiologic specialization of Colletotrichum lindemuthianum (Sacc. & Magn.) Bri. & Cav. on beans. Plant Disease Reporter. 38: 489-490. 1954.

was inoculated with race 2 and the other with race 3. Inoculations and readings were made as described by Summers[1].

As was to be expected, most lines were HR to race 3. Many lines HR to race 3 were CS to race 2. However, a number of Salvadorian lines appeared to be as resistant to race 2 as they were to race 3.

The make-up of the fall 1954 nursery was determined largely by the reaction of lines to race 2 in the summer disease nursery. Several progenies of all lines showing resistance to race 2 were planted. One or two progenies of lines HR to race 3 but CS to race 2 were planted to maintain the line on a standby basis. The inoculum for this nursery was made up of a mixture of races 2 and 3.

The effects from the inoculations were much more pronounced than in the summer disease test, and Salvadorian lines believed to be HR to race 2 were not so resistant after inoculation in the fall. The reaction of certain progenies of several lines of kenaf is given in Table 8 to illustrate differences obtained after the two inoculations. BG-51-1 and BG-52-33 were in general CS after both inoculations. It appeared that there was considerable resistance to race 2 in several lines typified by BG-52-14, BG-52-32, BG-52-35, BG-52-55 and BG-52-56 following inoculation in July, but these lines were for the most part S to CS in the fall. A few I plants in certain of these lines indicates possibilities for reselection for reaction to race 2. Lines BG-52-65, BG-51-7, BG-52-7 and BG-52-41 and a few others were also promising from the standpoint of resistance to race 2 in the summer, but were generally intermediate in reaction during the fall.

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The make-up of the fall 1954 nursery was determined largely by the reaction of lines to race 2 in the summer disease nursery. Several progenies of all lines showing resistance to race 2 were planted. One or two progenies of lines RR to race 3 but CS to race 2 were planted to maintain the line on a standby basis. The inoculum for this nursery was made up of a mixture of races 2 and 3.

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Table 8. Reaction of certain progenies of several lines of kenaf following inoculation with C. hibisci

Kenaf Line	Fort Lauderdale - Inoculated race 2, July					Hays Farm - Inoculated Mixture races 2 & 3, October				
	HR	R	I	S	CS	HR	R	I	S	CS
BG-51-1	0	0	0	1	10	0	0	0	0	5
"	0	0	0	2	9	0	0	0	0	5
BG-52-33	0	0	0	0	5	0	0	0	0	5
"	0	0	0	0	4	0	0	0	0	5
"	0	0	0	1	6	0	0	0	0	5
"	0	0	0	0	5	0	0	0	0	5
"	0	0	1	3	6	0	0	0	0	5
BG-52-14	7	2	1	0	0	0	1	3	18	0
"	9	0	0	0	0	0	0	2	20	3
"	11	1	0	0	0	0	0	16	3	3
"	11	3	0	0	0	0	0	9	6	9
BG-52-32	3	2	1	0	0	0	0	0	17	19
"	5	2	0	0	0	0	0	2	10	6
"	2	2	2	0	0	0	0	4	14	7
"	2	1	0	0	0	0	0	0	11	13
"	6	2	0	0	0	0	0	4	11	13
BG-52-35	4	2	2	0	0	0	0	0	5	21
"	0	4	0	0	0	0	0	0	8	23
"	3	1	4	0	0	0	0	0	21	5
"	0	2	0	0	0	0	0	0	7	13
"	5	2	0	0	0	0	0	0	8	16
BG-52-55	6	2	0	0	0	0	0	7	21	4
"	9	4	0	0	0	0	0	5	27	2
"	6	1	0	0	0	0	0	0	19	8
"	6	1	0	0	0	0	0	1	21	3
BG-52-56	2	3	0	0	0	0	0	0	7	20
"	6	1	0	0	0	0	0	0	16	6
"	10	2	2	0	0	0	0	4	15	2
"	2	3	0	0	0	0	0	3	9	1
BG-52-65	7	2	0	0	0	0	0	13	8	0
"	3	3	0	0	0	0	0	10	6	2
BG-51-7	6	3	0	0	0	0	2	27	3	0
"	2	4	1	0	0	0	3	28	0	0
"	6	4	0	0	0	0	0	0	0	31
BG-52-7	1	4	3	0	0	0	0	16	8	2
"	9	3	0	0	0	0	0	30	4	0
"	10	3	0	0	0	0	0	27	4	0
"	4	4	2	0	0	0	0	26	8	2

Table 8. Reaction of certain progenies of several lines of bread following inoculation with *S. tritici*

Bread Line	Fort Laudardale – Inoculated					Hope Farm – Inoculated			
	Race 2, July					Mixture races 2 & 3, October			
	HR	R	I	S	Di	HR	R	I	S
BG-51-1	0	0	0	1	10	0	0	0	0
"	0	0	0	2	9	0	0	0	0
BG-52-33	0	0	0	0	5	0	0	0	0
"	0	0	0	0	4	0	0	0	0
"	0	0	0	1	6	0	0	0	0
"	0	0	0	0	5	0	0	0	0
"	0	0	1	3	6	0	0	0	0
BG-52-14	7	2	1	0	0	0	1	3	18
"	9	0	0	0	0	0	0	2	20
"	11	1	0	0	0	0	0	16	3
"	11	3	0	0	0	0	0	9	6
BG-52-32	3	2	1	0	0	0	0	0	17
"	5	2	0	0	0	0	0	2	10
"	2	2	2	0	0	0	0	4	14
"	2	1	0	0	0	0	0	0	11
"	6	2	0	0	0	0	0	4	11
BG-52-35	4	2	2	0	0	0	0	0	5
"	0	4	0	0	0	0	0	0	8
"	3	1	4	0	0	0	0	0	21
"	0	2	0	0	0	0	0	0	7
"	5	2	0	0	0	0	0	0	8
BG-52-55	6	2	0	0	0	0	0	7	21
"	9	4	0	0	0	0	0	5	27
"	6	1	0	0	0	0	0	0	39
"	6	1	0	0	0	0	0	1	21
BG-52-56	2	3	0	0	0	0	0	0	7
"	6	2	0	0	0	0	0	0	16
"	10	2	2	0	0	0	0	4	15
"	2	3	0	0	0	0	0	3	9
BG-52-69	7	2	0	0	0	0	0	13	8
"	3	3	0	0	0	0	0	10	6
BG-51-7	6	3	0	0	0	0	2	27	3
"	8	4	1	0	0	0	3	28	0
"	6	4	0	0	0	0	0	0	21
BG-52-7	1	4	3	0	0	0	0	16	8
"	9	3	0	0	0	0	0	30	4
"	10	3	0	0	0	0	0	27	4
"	4	4	2	0	0	0	0	26	8

	HR	R	I	S	CS	HR	R	I	S	CS
BG-52-41	1	2	1	0	0	0	0	22	5	0
"	5	2	3	0	0	0	0	22	8	0
"	5	2	0	0	0	0	0	17	7	0
"	7	1	0	0	0	0	0	26	3	0
BG-52-110	0	1	0	0	0	0	13	0	0	0
"	-	-	-	-	-	0	14	0	0	0
BG-53-84	-	-	-	-	-	0	7	0	0	0
BG-53-85	0	0	0	0	7	0	0	0	0	15
BG-53-86	-	-	-	-	-	0	7	28	0	0
BG-53-88	-	-	-	-	-	0	31	0	0	0

BD-32-41	1	2	1	0	0	0	0	22	5	0
"	5	2	3	0	0	0	0	22	8	0
"	5	2	0	0	0	0	0	17	7	0
"	7	1	0	0	0	0	0	26	3	0
BD-32-120	0	1	0	0	0	0	13	0	0	0
"	-	-	-	-	-	0	14	0	0	0
BD-32-64	-	-	-	-	-	0	7	0	0	0
BD-32-85	0	0	0	0	7	0	0	0	0	15
BD-32-86	-	-	-	-	-	0	7	24	0	0
BD-32-88	-	-	-	-	-	0	31	0	0	0

No Salvadorian lines were found to be uniformly HR or even R in this nursery. A few plants in uniform I lines were classified R. Such plants were selected for selfing to determine if the progeny reaction is R or I.

The best resistance to C. hibisci was found in BG-52-110 (an F_4 Salvadorian x Javanese line) and BG-53-84 and BG-53-88 (S_1 lines out of an Egyptian introduction). All plants in these three lines were classified R. BG-52-110 is an entire leaf, red stem late line. It began flowering on 12/15 in comparison with a flowering date of about 11/5 for Salvadorian lines. The R Egyptian selections are also later (11/28) than Salvadorian, and are also considerably shorter.

The conflicting results obtained in these two nurseries show that testing and selecting for resistance must be done during the late fall or winter months. The extreme virulence of race 2 is indicated by the failure of any Salvadorian lines to be HR or R. However, it appears that uniform I lines could be grown for fiber or seed without serious effect from the disease. Plants of the I classification show a small lesion at the point of inoculation and small isolated lesions above or below the inoculation point. Recovery is rapid, and there is no appreciable effect on the plant. Seed capsules of such plants were not affected in the nursery, so seed production would probably not be influenced by the disease. The disease would probably affect such lines very little when grown in the summer for fiber, since lines found to be uniformly I or with a high proportion of I plants in the nursery were most resistant in the strain tests.

The uniform R reaction of BG-52-110 and certain lines selected in an Egyptian introduction indicate lines of greater resistance than the I Salvadorian lines are a possibility. Certainly Salvadorian and all other introductions must be more thoroughly tested to see if the recovery of more resistant types is possible.

Looking into the future from the standpoint of breeding for resistance to C. hibisci, plans are to put certain of the best uniform I Salvadorian lines in a spring nursery and also in isolation to begin seed increase. Next fall R and I selections in all lines will be placed in the nursery. In addition, the testing of large populations of Salvadorian and other introductions is planned.

At the present time, there is on hand a number of lines HR to races 1 and 3 but CS to race 2. Obviously such lines are of little value for fiber, but it is felt that they should not be discarded, because of the possibilities of their resistance to some future race of C. hibisci or even some other disease. Accordingly, one to two rows of each of these were planted in the 1954 fall nursery. Seed obtained will be placed in storage, and about every 3 years, fresh seed will be produced.

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SELECTION FOR RESISTANCE TO ROOT-KNOT NEMATODES

Studies were continued during 1954 on the interspecific hybrid of kenaf and the root-knot nematode resistant H. eetveldianus. This hybrid, first made at this station in 1951, was found to be almost completely sterile in 1952. Several seed were obtained on F_1 plants in 1952, and two F_2 plants were grown in 1953. Twenty seed were obtained from one of these and nine from the other. No seed were obtained in reciprocal crosses between F_1 plants and kenaf and F_2 plants and kenaf. Attempts were made in 1953 to double the chromosome number of the F_1 by immersing the terminal bud in a 0.5 percent solution of colchicine for various lengths of time. Growth indicating polyploidy occurred after 8 and 16 hour\ immersion treatments, but after the production of 2-3 polyploid leaves, normal growth was resumed and no seed were obtained.

During 1954, seed obtained from the two F_2 plants were planted. Variation in leaf and stem color, spines and other characteristics among these F_2 plants indicates that they are true segregates and not the result of apomixis. One plant was of particular interest because of the greener color of leaf and stem and cream flower color indicating the possibility of a backcross to kenaf. At this stage, all capsules from these plants have not been harvested, but it appears that the seed set on these plants is no better than on F_1 and F_2 plants. Reciprocal crosses between certain of these F_3 plants and kenaf were made, but no seed were obtained.

Colchicine treatment of the F_1 was continued in 1954. In addition, kenaf was also treated. Colchicine solution was mixed and treatments were made as described by Derman[1]. Certain treat-

[1]Derman, Haig. Colchiploidy in grapes. Jour. of Heredity. 45: 159-172. 1954.

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ments were too severe and the buds were killed. None of the treatments were effective in kenaf, but polyploidy was apparently induced in certain hybrid plants. However, as in 1953, normal growth was resumed after the production of a few polyploid leaves. A number of seed have been obtained from the treated branches. Capsules in the axis of apparently polyploid leaves have yielded as many as 10 seed. This number is unusually high in comparison with the untreated hybrid, and is encouraging from the sterility standpoint.

The recessive nature of the resistance contributed by H. setveldianus, the sterility of the hybrid and the difficulty of doubling the chromosome number of the hybrid by colchicine indicate some of the difficulties involved in the transfer of nematode resistance from the ornamental species to kenaf. It is hoped that sufficient time can be taken in 1955 to investigate the chromosome number of kenaf, H. setveldianus and the F_1. Since the pollen of the F_1 appears perfectly normal, studies on pollen germination and pollen tube growth should also be enlightening in explaining the sterility.

Additionally in 1955, all seed obtained on F1, F2 and F3 plants during 1954 will be planted and observed for seed production. The treatment of larger numbers of F_1 plants with colchicine is also planned to see if a stable polyploid shoot can be produced. More treatments must also be made on kenaf.

The recessive nature of the resistance contributed by *P. cebuyldiense*, the sterility of the hybrid and the difficulty of doubling the chromosome number of the hybrid by colchicine indicate some of the difficulties involved in the transfer of resistance from the ornamental species to kenaf. It is hoped that sufficient time can be taken in 1955 to investigate the chromosome number of kenaf, *H. cebuyldiense* and the F_1. Since the pollen of the F_1 appears perfectly normal, studies on pollen germination and pollen tube growth should also be undertaken in explaining the sterility.

Additionally in 1955, all seed obtained on F_1, F_2 and F_3 plants during 1954 will be planted and observed for seed production. The treatment of larger numbers of F_1 plants with colchicine is also planned to see if a stable polyploid sheet can be produced. More treatments must also be made on kenaf.

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SELECTION FOR A SPINELESS KENAF

The numerous spines on the capsules of kenaf create a considerable problem in the harvest of seed. Since the kenaf breeding project was initiated, some thought has been given to the development of a spineless kenaf. When the ornamental-kenaf cross was first made, it was thought that perhaps the near spineless nature of the ornamental could be transferred to a fiber type of kenaf. The sterility of the F_1 hybrid has so far prevented any progress in this direction.

All selections and introductions are observed in nursery plantings for any pronounced reduction in spines. Certain Salvadorian selections do appear to have fewer spines, particularly on the stalks and petioles. However, a much greater reduction in spines is desired. During 1954, an introduction of a spineless kenaf was obtained from Java. However, the seed were very old, and no plants were obtained.

During 1954, another possibility of obtaining spineless kenaf was initiated. Seed of BG-51-2, BG-52-18, BG-52-31 and BG-52-34 and the Salvadorian variety were irradiated by the Argonne National Laboratory with 905 rep of fast neutrons as a dosage rate of 5.0 rep per minute. If the presence of spines is conditioned by one major gene or even 2-3 genes cumulative in effect, irradiation offers the chance possibility of changing these genes and reducing the number of spines. Results obtained this year were discouraging. Apparently the dosage rate was not high enough since no abnormalities were found in plants from treated seed. It is desirable to have seed treated at a higher dosage rate to see if abnormalities, and especially reduction in spines, can be induced.

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STRAIN TESTS

Forty-eight Salvadorian lines possessing good resistance to C. hibisci race 3 and the parent variety were tested for yield in a 7 x 7 simple lattice at Belle Glade in 1953. Wide differences in percent fiber, total green yield and dry fiber yield were noted. The amount of C. hibisci that developed in this experiment was negligible, and was not an important factor in differentiating yields. (See 1953 annual report for complete results of this test.)

Two yield experiments were carried out in 1954. Eighteen of the highest yielding lines and five of the lower yielding lines in the 1953 test, the parent variety and composite A (made up in 1953 of four Salvadorian lines) were tested in a 5 x 5 lattice square at Belle Glade in 1954. The remaining 25 lower yielding Salvadorian lines from the 1953 test, 37 previously untested Salvadorian lines, composite A and the Salvadorian variety were tested in an 8 x 8 simple lattice at Belle Glade in 1954. Plantings in the lattice square experiment were made on April 28, in the simple lattice experiment on May 14. Open-pollinated seed of each line were planted in 7 inch rows at a seeding rate of 30 pounds per acre. In the lattice square, plots were 10 rows 20 feet long of which 67 square feet were harvested for total green yield. In the simple lattice plots were 6 rows x 16 feet long of which 33.6 square feet were harvested for total green yield.

In both experiments, excellent stands of kenaf were obtained. A severe natural infection of C. hibisci race 2 developed in lines susceptible to this race. After the disease had reached its

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In both experiments, excellent stands of kenaf were obtained. A severe natural infection of *S. hibiscoi* race 2 developed in lines susceptible to this race. After the diseases had reached its

maximum severity, 50 plants in each plot were rated for degree of infection with C. hibisci. Plants were placed in the five classes set up by Dr. Summers.

Harvests were made 110 days after planting. Two ten-stalk sub-samples were taken from each plot for fiber determinations. The fiber was extracted on a hand-fed raspador type decorticator, and was dried to constant weight in a forced air oven at 100°F. Percentage fiber of total green weight and total fiber yields were calculated from the dry fiber weights.

Plot figures for percent fiber, total green yield and dry fiber yield were statistically analyzed as outlined for lattice square and simple lattice experiments by Cochran and Cox in Experimental Designs. Adjusted means for percent fiber, total green yield (acre basis) and dry fiber yield (acre basis) for the two experiments are given in Tables 9 and 10. Lines are arranged in order of decreasing mean dry fiber yields.

The greatest single factor affecting yield in the tests was the severity of infection with C. hibisci. In order to arrive at a percent susceptibility figure, plants classified I, S and CS were combined and termed susceptible. These percentages were not subjected to a lattice analysis and unadjusted means are given in the tables.

Because of the close relationship of percent susceptibility with percent fiber, green yield and fiber yield, the line variation was partitioned into a linear regression component and deviations therefrom. Regression and correlation coefficients were calculated using percent susceptibility as the independent variate (X) and the

Table 9. Percent fiber, total green yield, dry fiber yield and percent susceptibility to C. hibisci of 23 Salvadorian lines of kenaf, composite A and the Salvadorian variety. (5 x 5 lattice square. Kenaf experiment 54-2, Belle Glade.)

Kenaf Line	Percent Fiber	Yield, 1000 lbs./acre Total	Dry Fiber	Percent Susceptibility to C. hibisci
BG-5235	4.85	60.91	2.903	15
BG-52-20	4.69	61.30	2.793	13
BG-52-65	4.74	56.70	2.722	6
BG-52-19	4.69	58.45	2.650	33
BG-52-75	3.99	62.21	2.508	5
BG-52-22	4.74	52.03	2.488	27
BG-52-32	4.52	53.91	2.449	2
BG-52-34	4.65	53.07	2.436	7
BG-52-17	4.63	49.44	2.262	35
BG-52-18	4.23	50.16	2.119	89
BG-52-74	3.96	49.83	1.970	59
Composite A	3.91	51.45	1.938	29
BG-52-66	3.80	43.48	1.672	71
BG-52-83	3.72	43.74	1.646	69
BG-52-88	3.62	46.53	1.646	47
Variety J	3.75	42.44	1.626	73
BG-52-5	3.69	38.17	1.503	71
BG-52-16	3.17	34.02	1.153	80
BG-52-33	2.96	38.43	1.095	91
BG-51-1	2.86	37.13	1.069	68
BG-52-3	3.28	22.66	1.037	84
BG-52-59	2.67	37.45	0.985	76
BG-52-25	3.44	29.55	0.959	96
BG-52-30	2.38	33.05	0.823	97
BG-51-7	3.57	22.87	0.654	96
Grand Mean	3.86	45.55	1.801	
Range	2.38 to 4.85	22.87 to 62.21	0.654 to 2.903	
C.V.	10.98	13.31	20.07	
LSD .05	.71	10.20	0.611	
LSD .01	.97**	13.86**	0.829**	

Analysis of Variance - mean squares - lattice square

Source of Variation	DF	Percent Fiber	Green Yield	Fiber Yield
Reps	2	1.36	109.14	0.58
Lines	24	1.44	756.44	3. 12
Regression on C. hibisci	1	17.00	14,934.79	54.01
Deviations	23	.77	183.47	.91

Table 9. Percent fiber, total green yield, dry fiber yield and percent susceptibility to G. hirsuta of 23 Salvadorian lines of Leaf, composite A and the Salvadorian variety. (5 x 5 lattice square.

Leaf escaping 5%-S. Delta Diets.)

Leaf Lines	Percent Fiber	Yield, lbs./acre Total	Dry Fiber	Percent Susceptibility to G. hirsuta
SD-5295	4.09	60.91	2.903	15
SD-52-20	4.69	61.30	2.793	13
SD-52-65	4.74	56.70	2.783	6
SD-52-19	4.09	58.45	2.630	33
SD-52-75	3.99	62.22	2.508	5
SD-52-22	4.74	52.03	2.488	27
SD-52-32	4.32	53.91	2.449	2
SD-52-34	4.65	53.07	2.436	7
SD-52-17	4.63	49.44	2.262	35
SD-52-18	4.23	50.16	2.119	89
SD-52-74	3.96	49.83	1.970	59
Composite A	3.72	51.45	1.938	39
SD-52-66	3.80	43.48	1.672	72
SD-52-63	3.72	43.74	1.646	69
SD-52-88	3.62	45.59	1.646	47
Variety 4	3.79	42.44	1.626	73
SD-52-5	3.69	38.17	1.409	71
SD-52-16	3.17	34.02	1.193	80
SD-52-33	2.96	38.43	1.095	91
SD-51-1	2.86	37.13	1.069	68
SD-52-3	3.28	22.66	1.037	84
SD-52-59	2.87	27.45	0.969	76
SD-52-25	3.44	29.55	0.959	96
SD-52-30	2.36	33.05	0.829	97
SD-51-7	3.37	25.87	0.854	96
Grand Mean	3.86	45.95	1.801	
	2.36	22.87	0.654	
Range	to	to	to	
	4.69	62.22	2.903	
C.V.	10.98	13.21	20.07	
LSD .05	.71	10.20	0.622	
LSD .01	.97**	13.86**	0.839**	

Analysis of Variance - mean squares - lattice square

Source of Variation	DF	Percent Fiber	Green Yield	Fiber Yield
Reps	2	1.35	109.14	0.58
Lines	24	1.44	756.44	3. 12
Regression unadj.				
G. hirsuta	1	17.00	14,934.79	34.01
Deviations	23	.77	389.47	.91

Rows	12	1.01	194.71	1.09
Columns	12	0.12	82.56	0.30
Error	24	0.15	73.10	0.25

	Percent Fiber	Green Yield	Fiber Yield
Average standard error (adj. treatment means)	0.12	7.64	0.21
Effective error variance	0.18	87.63	0.31
Relative efficiency over random block percent	200	121	152

Analyses of Variance - mean squares - randomized block

Source of Variation	DF	Percent Fiber	Green Yield	Fiber Yield
Reps	2	1.36*	109.14	0.58
Lines	24	1.44**	756.44**	3.12**
Regression on % C. hibisci	1	17.00**	14,934.79**	54.01**
Deviations	23	.77*	183.47	.91*
Error	48	.36	105.87	.47

Regression Coefficients	% C. hibisci
% Fiber	-.0137**
Green Yield	-.406 lbs. (plot); -263 lbs. (acre)**
Fiber Yield	-.0244 lbs. (plot); -15.8 lbs. (acre)**

Correlation Coefficients	% C. hibisci
% Fiber	-.56**
Green Yield	-.80**
Fiber Yield	-.74**

*Significant
**Highly Significant

Reps	12	1.01	291.71	1.09
Columns	12	0.12	82.56	0.30
Error	24	0.15	73.19	0.25

	Percent Fiber	Green Yield	Fiber Yield
Average standard error (adj. treatment means)	0.12	7.64	0.21
Effective error variance	0.15	87.63	0.31
Relative efficiency over random block percent	200	121	152

Analysis of Variance - Mean squares - Restricted Block

Source of Variation	DF	Percent Fiber	Green Yield	Fiber Yield
Reps	2	1.36*	109.14	0.38
Plots	24	1.44**	756.44**	3.12**
Regression on % O. Mildred	1	17.00**	14,934.79**	54.01**
Deviations	23	.77*	183.47	.91*
Error	48	.36	105.87	.47

Regression Coefficients

	% O. Mildred
% Fiber	-.0137**
Green Yield	-.406 lbs. (plot); -865 lbs. (acre)**
Fiber Yield	-.0244 lbs. (plot); -15.8 lbs. (acre)**

Correlation Coefficients

	% O. Mildred
% Fiber	-.96**
Green Yield	-.80**
Fiber Yield	-.74**

*Significant
**Highly Significant

Table 10. Percent fiber, total green yield, dry fiber yield and percent susceptibility to C. hibisci of 62 Salvadorian lines of kenaf, composite A and the Salvadorian variety. (8 x 8 simple lattice. Kenaf experiment 54-3. Belle Glade.)

Kenaf Lines	Percent Fiber	Yield, 1000 lbs./acre Total	Dry Fiber	Percent Susceptibility To C. hibisci
BG-52-56	5.47	75.75	4.095	14
BG-52-37	4.81	67.07	3.214	22
BG-52-55	4.74	67.00	3.201	7
BG-52-71	4.77	66.29	3.175	7
BG-52-63	4.99	62.99	3.162	3
BG-52-54	5.44	59.42	3.123	10
BG-52-36	4.22	69.53	3.020	8
BG-52-7	4.66	67.26	3.020	9
BG-52-68	4.63	62.60	2.955	4
BG-52-62	4.00	71.22	2.812	20
BG-52-64	4.67	58.71	2.722	1
BG-52-38	4.10	64.02	2.709	30
BG-52-2	4.33	63.05	2.696	3
BG-52-70	4.78	56.05	2.683	20
BG-52-31	4.15	65.06	2.657	19
BG-52-1	4.84	54.24	2.592	5
BG-52-67	4.57	56.76	2.592	14
BG-52-69	4.20	58.13	2.514	13
BG-52-41	4.06	58.19	2.436	10
BG-52-44	3.96	60.46	2.398	13
BG-52-86	4.42	56.57	2.385	9
BG-52-40	4.32	56.25	2.372	15
Composite A	4.55	51.39	2.307	14
BG-52-29	3.83	59.94	2.268	36
BG-52-45	4.47	48.41	2.203	15
BG-52-42	4.02	57.72	2.164	12
BG-52-60	3.93	53.33	2.112	48
BG-52-21	4.10	52.36	2.074	49
BG-52-72	3.85	53.59	2.061	56
BG-52-85	4.40	46.27	2.009	22
BG-52-81	4.50	43.87	2.009	38
BG-52-14	4.00	49.64	1.957	17
BG-52-9	3.92	50.67	1.944	42
BG-52-28	3.55	57.09	1.944	31
BG-52-76	3.58	51.65	1.840	39
BG-52-94	3.53	51.13	1.840	64
BG-52-82	3.32	51.71	1.711	49
BG-52-15	3.62	46.92	1.685	48
BG-52-78	3.66	44.45	1.659	35
BG-52-93	3.90	42.51	1.633	50
Variety J	4.12	40.89	1.633	57
BG-52-79	3.29	47.04	1.503	35
BG-52-61	3.67	38.62	1.427	45
BG-51-6	3.54	39.27	1.387	47

Table 10. Percent fiber, total green yield, dry fiber yield and percent susceptibility to U. nitens of 62 Salvadorian lines of Jamaf, composite A and the Salvadorian variety. (8 x 8 simple lattice. Jamaf experiment 52-3. Santa Ana.)

Jamaf Lines	Percent Fiber	Yield, 1000 lbs./acre Total Fiber	Percent Susceptibility No. Diseased
SA-52-56	3.47	75.75	14
SA-52-37	4.44	67.07	22
SA-52-57	4.74	67.00	7
SA-52-71	4.77	66.29	7
SA-52-43	4.90	62.99	3
SA-52-54	5.44	59.42	10
SA-52-36	4.22	69.33	8
SA-52-7	4.44	67.36	9
SA-52-58	4.65	62.60	4
SA-52-62	4.00	71.22	20
SA-52-64	4.67	58.71	1
SA-52-28	4.12	64.02	30
SA-52-2	4.33	63.05	3
SA-52-70	4.78	56.05	20
SA-52-31	4.15	65.66	19
SA-52-1	4.84	54.24	5
SA-52-67	4.37	56.76	14
SA-52-69	4.20	58.13	13
SA-52-41	4.06	58.19	10
SA-52-44	3.96	60.46	13
SA-52-66	4.42	56.37	9
SA-52-40	4.32	56.25	15
Composite A	4.57	51.39	14
SA-52-29	3.89	59.94	36
SA-52-45	4.47	46.41	18
SA-52-42	4.04	57.72	12
SA-52-60	3.93	53.33	16
SA-52-23	4.10	52.36	19
SA-52-72	3.85	53.59	26
SA-52-65	4.40	46.27	22
SA-52-61	4.30	43.87	28
SA-52-14	4.00	49.64	17
SA-52-9	3.92	50.67	42
SA-52-26	3.65	57.09	31
SA-52-76	3.58	51.65	39
SA-52-24	3.59	52.13	64
SA-52-62	3.32	51.71	49
SA-52-15	3.62	44.92	48
SA-52-78	3.46	44.45	39
SA-52-53	3.90	42.31	30
Variety 1	4.12	40.89	37
SA-52-79	3.29	47.04	39
SA-52-61	3.67	38.62	48
SA-52-6	3.34	39.27	47

BG-51-10	3.44	39.01	1.322	34
BG-51-2	3.88	33.63	1.270	58
BG-52-23	3.38	36.48	1.270	69
BG-52-43	3.22	40.95	1.257	40
BG-52-26	2.92	38.30	1.140	51
BG-51-5	3.23	34.93	1.115	14
BG-52-84	2.92	39.59	1.102	34
BG-52-8	3.18	39.33	1.102	55
BG-51-8	3.17	34.28	1.063	71
BG-51-9	2.84	38.04	1.037	78
BG-52-4	3.16	32.14	1.037	43
BG-52-92	3.10	31.62	.985	49
BG-52-77	2.59	38.43	.959	39
BG-52-58	2.72	31.43	.881	53
BG-52-80	3.15	28.12	.868	68
BG-51-11	2.28	39.92	.868	79
BG-52-130	2.44	27.35	.648	13
BG-52-24	2.35	21.51	.544	68
BG-51-12	1.88	30.07	.531	71
BG-52-12	2.04	18.40	.375	90
Grand Mean	3.80	48.73	1.918	
Range	1.88 to 5.47	18.40 to 75.75	0.375 to 4.095	
C.V.	11.34	15.21	19.26	
LSD .05	.87	14.89	0.743	
LSD .01	1.16**	19.87**	0.990**	

Analyses of Variance - mean squares - simple lattice

Source of Variation	DF	Percent Fiber	Green Yield	Fiber Yield
Reps	1	11.66	74.41	0.99
Lines	63	1.34	178.31	0.74
Regression on % C. hibisci	1	50.02	3,426.40	15.68
Deviations	62	0.55	125.92	0.50
Blocks in reps	14	0.60	90.93	0.22
Intra-block error	49	0.16	28.32	0.07

	Percent Fiber	Green Yield	Fiber Yield
Average standard error (adj. treatment means)	0.43	5.72	0.28
Effective error variance	0.19	32.66	0.08
Relative efficiency over random block %	139	129	137

BO-32-10	3.44	29.03	1.322	34
BO-31-2	3.88	33.69	1.270	58
BO-32-29	3.38	36.18	1.270	69
BO-32-43	3.22	40.95	1.257	40
BO-32-26	2.92	38.30	1.140	32
BO-31-3	3.29	34.93	1.118	34
BO-32-24	2.92	35.95	1.102	34
BO-32-8	3.18	39.39	1.102	55
BO-31-8	3.17	34.28	1.069	71
BO-31-9	2.84	38.04	1.057	76
BO-32-4	3.16	32.14	1.037	43
BO-32-32	3.10	30.42	.985	49
BO-32-37	2.59	28.43	.959	39
BO-32-36	2.72	23.43	.821	29
BO-32-40	3.15	23.12	.868	68
BO-32-11	2.28	29.92	.864	79
BO-32-130	2.41	27.39	.648	13
BO-32-24	2.35	21.51	.714	68
BO-31-12	1.89	30.07	.591	71
BO-32-12	2.04	18.10	.375	90
Grand Mean	3.80	42.73	1.918	
Range	1.88 to 5.49	18.40 to 75.75	0.375 to 4.099	
C.V.	11.34	15.21	19.36	
LSD .05	.87	14.89	0.743	
LSD .01	1.16**	19.87**	0.990**	

Analysis of Variance - room squares - simple lattice

Source of Variation	DF	Percent Fiber	Green Yield	Fiber Yield
Reps	3	11.66	74.41	0.99
Lines	69	1.34	178.31	0.74
Regression on C. bibiaca	1	50.02	3,426.40	15.68
Deviations	62	0.59	125.92	0.50
Blocks in reps	14	0.60	90.93	0.22
Intra-block error	49	0.16	28.32	0.07

	Percent Fiber	Green Yield	Fiber Yield
Average standard error (adj. treatment means)	0.43	5.72	0.28
Effective error variance	0.19	32.86	0.08
Relative efficiency over random block %	139	159	137

Analyses of Variance - mean squares - randomized block

Source of Variation	DF	Percent Fiber	Green Yield	Fiber Yield
Reps	1	11.66**	74.41	0.99**
Lines	63	1.34**	178.31**	0.74**
Regression on % Co. hibisci	1	50.02**	3,426.40**	15.68**
Deviations	62	.55**	125.92**	.50**
Error	63	.25	42.24	.11

Regression Coefficients	% C. hibisci
% Fiber	-.0234**
Green Yield	-.193 lbs. (plot); -241 lbs. (acre)**
Fiber Yield	-.0131 lbs. (plot); -16.3 lbs. (acre)**

Correlation Coefficient	% C. hibisci
% Fiber	-.67**
Green Yield	-.55**
Fiber Yield	-.54**

*Significant
**Highly Significant

Analysis of Variance - mean squares - replicated block

Source of Variation	DF	Percent Fiber	Green Yield	Fiber Yield
Reps	1	11.6**	74.43	0.99**
Lines	63	1.34**	178.32**	0.74**
Regression on % Co. Lint	1	80.02**	3,425.40**	19.68**
Deviations	62	.5**	123.92**	.30**
Error	63	.25	42.24	.11

Regression Coefficients % Co. Lint

% Fiber -.0234**
Green Yield -.189 lbs. (plot); -241 lbs. (acre)**
Fiber Yield -.0131 lbs. (plot); -16.3 lbs. (acre)**

Correlation Coefficient % Co. Lint

% Fiber -.07**
Green Yield -.56**
Fiber Yield -.34**

*Significant
**Highly Significant

percent fiber, green yield and dry fiber yields as the dependent variates (Y_1, Y_2 and Y_3).

Coefficients of variation were calculated from the effective error variances of the lattice analyses. LSD calculations were based on the average standard errors from the lattice analyses. The lattice and randomized block analyses of variance are listed in the tables as well as the average standard errors, effective error variances and relative efficiencies for the lattice designs. Regression and correlation coefficients for percent C. hibisci with percent fiber, green yields and fiber yield are also given in the tables.

A glance at the line means and the .01 LSD figures will show that differences between lines for percent fiber, green yield and dry fiber yield were highly significant in both experiments. The randomized block analyses for both experiments also shows highly significant line differences for the above-mentioned factors. The major portion of the line variation was found to be due to linear regression. In the lattice analyses the choice of an appropriate error term for testing the significance of the regression components and the derivations is questionable, and the test for significance was made in the randomized block analyses. In these analyses the linear regression component was highly significant for all factors in both experiments. Deviations were highly significant for all factors in the simple lattice experiment, while deviations for percent fiber and dry fiber yield were significant in the lattice square.

A t test was made to test the significance of the negative regression coefficients. All were found to be highly significant. Likewise, all the negative correlation coefficients were highly significant.

percent fiber, green yield and dry fiber yields as the dependent variates (Y_1, Y_2 and Y_3).

Coefficients of variation were calculated from the effective error variances of the lattice analyses. IRD calculations were based on the average standard errors from the lattice analyses. The lattice and randomized block analyses of variance are listed in the tables as well as the average standard errors, effective error variances and relative efficiencies for the lattice designs. Regression and correlation coefficients for percent $\underline{E}$. plicata with percent fiber, green yields and fiber yield are also given in the tables.

A glance at the time means and the .01 LSD figures will show that differences between times for percent fiber, green yield and dry fiber yield were highly significant in both experiments. The randomized block analyses for both experiments also show highly significant time differences for the above-mentioned factors. The major portion of the time variation was found to be due to linear regression. In the lattice analyses the choice of an appropriate error term for testing the significance of the regression components and the deviations is questionable, and the test for significance was made in the randomized block analyses. In these analyses the linear regression component was highly significant for all factors in both experiments. Deviations were highly significant for all factors in the simple lattice experiment, while deviations for percent fiber and dry fiber yield were significant in the lattice squares.

A t test was made to test the significance of the negative regression coefficients. All were found to be highly significant. Likewise, all the negative correlation coefficients were highly significant.

The lattice designs were considerably more effective than randomized blocks as shown by the relative efficiency percentages. However, the occurrence of CS lines in both experiments affected the lattice analyses. Much of the adjustment in means then must be due to disease rather than to random block differences. Therefore, unadjusted means must be considered when thinking of the yield potential of any particular line.

The reaction of all these lines to race 2 is now known (see section on resistance to C. hibisci). Highly susceptible lines will not appear in any future strain tests except possibly as checks. Lines promising from the standpoint of tolerance to race 2 will continue to be tested.

The lattice designs were considerably more effective than randomized blocks as shown by the relative efficiency percentages. However, the occurrence of 0S lines in both experiments affected the lattice analyses. Much of the adjustment in means then must be due to disease rather than to random block difference. Therefore, unadjusted means must be considered when thinking of the yield potential of any particular line.

The reaction of all these lines to race 2 is now known (see section on resistance to O. bifidus). Highly susceptible lines will not appear in any future strain tests except possibly as checks. Lines pyramiding from the standpoint of tolerance to race 2 will continue to be tested.

FIBER QUALITY OF KENAF LINES

Forty-eight Salvadorian lines and the parent variety were tested for yield in a 7 x 7 simple lattice at Belle Glade in 1953. Yield data from this experiment were reported in the 1953 annual report. During 1954, fiber quality tests were completed and the data analyzed.

Decorticated fiber from two ten-stalk sub-samples from each plot was available for making quality tests. In most previous work on quality of kenaf fiber at this station, all bundles for testing were taken from one sub-sample from each plot. In many of these experiments, bundle variation within the same sub-sample was rather small in comparison with plot and determination variation. It was thought that perhaps a more reliable measure of quality could be obtained if bundles were drawn from each of the fiber sub-samples. Accordingly for tensile strength, one bundle was drawn from each sub-sample, and five 1/2 inch breaks were made for each bundle. For shear, one bundle was taken from each sub-sample, and two measurements were made for each bundle. Two bundles from each sub-sample were used to determine flex, while four bundles were drawn from each sub-sample for the wear tests.

The data were analyzed, first as a simple lattice using means for the individual plot figures. Gains in efficiency for the lattice analyses in comparison with the randomized block analyses were very low. A randomized block analysis on the individual laboratory determinations was made for comparison with the lattice analysis and to study plot, bundle and determination variation. Mean strength, shear, wear and flex data, randomized block analyses of variance

FIBER QUALITY OF KNOWN LINES

Forty-eight Salvadoran lines and the parent variety were tested for yield in a 7 x 7 simple lattice at Santa Clara in 1953. Yield data from this experiment were reported in the 1953 annual report. During 1954, fiber quality tests were completed and the data analyzed.

Decorticated fiber from two ten-stalk sub-samples from each plot was available for testing quality tests. In most previous work on quality of lint fiber at this station, all bundles for testing were taken from one sub-sample from each plot. In many of these experiments, bundle variation within the same sub-sample was rather small in comparison with plot and determination variation. It was thought that perhaps a more reliable measure of quality could be obtained if bundles were drawn from each of the fiber sub-samples. Accordingly for tensile strength, one bundle was drawn from each sub-sample, and five 1/2 inch breaks were made for each bundle. For elmer, one bundle was taken from each sub-sample, and two measurements were made for each bundle. Two bundles from each sub-sample were used to determine flex, while four bundles were drawn from each sub-sample for the wear tests.

The data were analyzed, first as a simple lattice using means for the individual plot figures. Gains in efficiency for the lattice analyses in comparison with the randomized block analyses were very low. A randomized block analysis on the individual laboratory determinations was made for comparison with the lattice analysis and to study plot, bundle and determination variation. Mean strength, elmer, wear and flex data, randomized block analyses of variance

and estimated variance components are given in Table 11.

Differences between lines were not significant for any of the quality factors in either the lattice or the randomized block analyses, even though the range in means was of sufficient magnitude that significant differences might be expected. But as has been true of much of the quality data from the Belle Glade laboratory, error variations were of such magnitude that differences between lines were non-significant. Except for shear, coefficients of variation were very high. The sampling technique does not appear to have been improved by drawing bundles from both fiber sub-samples.

The magnitude of tensile strength error variations for three lines can be seen in Table 12. Large differences among determinations within the same bundle and between bundle and replication means are evident. The replication means also show the extent of the replication x line interactions. Variations in tensile strength measurements of the other lines were of a similar nature, although not as extreme as those presented in Table 12. Individual shear, wear and flex determinations also varied in much the same way as tensile strength.

It is evident from this and the other quality data from the Belle Glade laboratory that there is a need for a better technique of measurement in the laboratory and more reliable methods of sampling. Previous data have indicated that such factors as soil type and method of extraction may have more important bearing on quality than variety. However, as more divergent types of kenaf are introduced and used in the breeding work, it is expected that quality differences will become more important. And in order to measure such differences and develop varieties of good quality, more reliable methods of measuring quality are needed.

and estimated variance components are given in Table 11.

Differences between lines were not significant for any of the quality factors in either the lettuce or the rendered lipid analyses, even though the range in means was of sufficient magnitude that significant differences might be expected. But as has been true of much of the quality data from the Delle Glade laboratory, error variations were of such magnitude that differences between lines were non-significant. Except for sheen, coefficients of variation were very high. The sampling technique does not appear to have been improved by drawing bundles from both fiber sub-samples.

The magnitude of tensile strength error variations for three lines can be seen in Table 12. Large differences among determinations within the same bundle and between bundle and replication means are evident. The replication means also show the extent of the replication x line interactions. Variations in tensile strength measurements of the other lines were of a similar nature, although not as extreme as those presented in Table 12. Individual sheen, wear and flex determinations also varied in much the same way as tensile strength.

It is evident from this and the other quality data from the Belle Glade laboratory that there is a need for a better technique of measurement in the laboratory and more reliable methods of sampling. Previous data have indicated that such factors as soil type and method of extraction may have more important bearing on quality than variety. However, as more divergent types of hemp are introduced and used in the breeding work, it is expected that quality differences will become more important. And in order to measure such differences and develop varieties of good quality, more reliable methods of measuring quality are needed.

Table 11. Mean strength, shear, wear and flex measurements of kenaf lines tested for yield at Belle Glade in 1953

Line	1000 lbs. per sq. in. Strength	Shear	Cycles to failure Wear	Flex
BG-51-1	28.4	12.2	169	788
BG-51-7	31.2	14.8	177	1027
BG-52-2	31.4	12.4	91	857
BG-52-3	26.3	13.7	94	952
BG-52-5	25.4	11.1	280	930
BG-52-14	28.9	12.4	115	886
BG-52-16	27.7	13.0	117	952
BG-52-17	28.6	13.5	146	738
BG-52-18	32.4	12.4	278	992
BG-52-19	33.0	12.8	80	1100
BG-52-20	26.4	12.2	129	743
BG-52-22	33.0	14.8	162	942
BG-52-23	27.6	12.2	132	929
BG-52-25	26.7	12.3	226	1027
BG-52-27	21.4	12.1	138	683
BG-52-28	23.4	12.3	254	896
BG-52-29	24.1	13.3	119	687
BG-52-30	28.8	12.8	99	887
BG-52-31	24.2	13.7	96	1103
BG-52-32	31.7	13.2	142	1184
BG-52-33	26.3	12.7	127	946
BG-52-34	30.8	12.5	247	760
BG-52-35	35.2	12.2	138	786
BG-52-36	26.9	12.6	200	1095
BG-52-42	22.4	12.4	84	621
BG-52-59	25.4	13.1	132	788
BG-52-62	27.1	13.7	71	869
BG-52-63	25.4	11.0	177	1112
BG-52-64	24.5	13.3	144	667
BG-52-65	26.5	15.2	124	866
BG-52-66	26.8	13.2	112	838
BG-52-67	26.4	13.0	133	742
BG-52-70	21.6	13.6	138	753
BG-52-73	29.2	12.8	168	819
BG-52-74	24.3	12.6	206	869
BG-52-75	23.8	12.2	87	837
BG-52-76	25.0	12.9	151	786
BG-52-77	26.8	11.7	86	678
BG-52-79	28.6	13.4	109	964
BG-52-80	27.3	13.8	117	874
BG-52-81	23.2	11.9	135	939
BG-52-83	28.5	11.9	122	1037
BG-52-84	28.0	13.5	101	654
BG-52-85	25.1	11.8	121	804
BG-52-86	24.1	12.6	183	712

Table II. Mean strength, sheer, wear and flex measurements of kenaf lines tested for yield at Delta Plots in 1952

Line	Strength 1500 lbs. per sq. in.	Sheer	Wear	Cycles to Failure Flex
MO-51-1	28.4	12.2	169	758
MO-51-7	31.2	14.8	177	1027
MO-52-2	31.4	12.4	91	857
MO-52-3	26.3	13.7	94	972
MO-52-5	25.4	11.1	280	930
MO-52-14	28.9	12.4	115	886
MO-52-16	27.7	13.0	117	992
MO-52-17	28.6	13.5	146	738
MO-52-18	32.4	12.4	278	998
MO-52-19	33.0	12.8	80	1100
MO-52-20	26.4	12.2	139	743
MO-52-22	33.0	14.8	162	942
MO-52-23	27.6	12.2	132	929
MO-52-25	26.7	12.3	256	1027
MO-52-27	27.4	12.1	138	683
MO-52-28	25.4	12.3	254	896
MO-52-29	24.1	13.3	119	687
MO-52-30	26.2	12.8	99	857
MO-52-31	24.2	13.7	96	1103
MO-52-32	31.7	13.2	142	1184
MO-52-33	30.3	12.7	127	946
MO-52-34	30.8	12.5	247	760
MO-52-35	35.2	12.2	138	786
MO-52-36	26.9	12.6	200	1095
MO-52-42	22.4	12.4	84	621
MO-52-59	25.4	13.1	138	768
MO-52-62	27.1	13.7	71	896
MO-52-63	25.4	11.0	177	1112
MO-52-64	24.5	13.3	144	667
MO-52-65	26.5	13.2	124	866
MO-52-66	26.6	13.2	112	838
MO-52-67	26.4	13.0	133	748
MO-52-70	21.6	13.6	138	752
MO-52-73	29.2	12.8	108	819
MO-52-74	24.3	12.6	226	869
MO-52-75	23.8	12.2	87	837
MO-52-76	25.0	12.9	121	786
MO-52-77	26.8	11.7	86	674
MO-52-79	28.6	13.4	109	964
MO-52-80	27.3	13.8	117	874
MO-52-81	23.2	11.9	135	979
MO-52-83	26.5	11.9	122	1037
MO-52-84	28.0	13.5	103	694
MO-52-85	25.3	11.8	123	804
MO-52-86	24.1	12.6	183	712

BG-52-88	24.6	12.0	128	872
BG-52-92	23.5	13.1	125	923
BG-52-94	22.8	12.6	169	890
Variety J	27.8	14.1	167	697
Grand Mean	26.9	12.8	144	867
Range	21.4-35.2	11.0-15.2	71-280	621-1184
C.V.	65.5	17.7	88.6	48.8

Analysis of Variance (random block) - mean squares

Source	DF	Strength	Shear	Wear	Flex
Reps	1	3.34	18.21	23,006	8,353,245**
Lines	48	198.72	5.98	19,842	146,267
R x L	48	310.28	5.10	16,286	179,357
Bundles in Reps	98	28.05	5.51	15,019	91,960
Determinations in Bundles	*	42.73	4.06	5,741	54,652

*DF: Strength, 784; Shear, wear and flex, 196
**Highly significant

Estimated Variance Components

Source	Strength	Shear	Wear	Flex
Plots	26.75	0	317	21,849
Bundles	0	.72	4,639	18,654
Determinations	42.73	4.06	5,741	54,652

80–92–98	24.6	12.0	128	872
81–92–92	23.5	13.1	125	923
90–92–94	22.8	12.6	109	890
Variety 1	27.8	14.1	157	897
Grand Mean	26.9	12.8	144	887
Range	21.4–33.2	11.0–15.2	72–260	621–1104
C.V.	6.8	17.7	86.6	16.8

Analysis of Variance (random block) – Mean Squares

Source	DF	Strength	Shear	Wear	Flex
Reps	3	3.34	18.23	23,006	6,339,243**
Lines	48	196.72	5.98	19,842	146,267
R x L	48	210.28	5.10	16,286	179,337
Residual in Reps	96	26.05	5.51	15,039	91,960
Interactions in Residual	4	42.72	4.06	5,742	34,658

"DF": Strength, Shear, Wear and Flex, 196
**Highly significant

Replicated Variance Components

Source	Strength	Shear	Wear	Flex
Plots	26.75	C	317	21,049
Residual	0	.72	4,639	18,654
Interactions	42.72	4.06	5,742	34,658

Table 12. Variation of 1/2" tensile strength measurements within three lines of kenaf

Line	Rep	Bundle	1/2" tensile strength determinations					Bundle Mean	Rep Mean	Line Mean
52-27	I	1	17.1	17.7	27.5	23.0	25.5	22.2		
	I	2	26.3	19.4	13.5	24.9	9.9	18.8	20.5	
	II	1	13.9	22.2	24.5	23.4	25.5	21.9		
	II	2	19.9	25.1	19.9	30.0	18.5	22.7	22.3	21.4
52-35	I	1	24.2	26.6	31.2	23.1	32.6	27.5		
	I	2	39.7	31.9	37.9	20.9	34.7	33.0	30.3	
	II	1	31.7	31.1	31.7	35.6	31.0	32.2		
	II	2	49.8	45.6	42.0	54.8	47.8	48.0	40.1	35.2
Variety J	I	1	33.1	12.2	28.3	27.4	32.2	26.6		
	I	2	40.1	47.2	33.1	49.6	31.8	40.4	33.5	
	II	1	23.6	22.7	34.4	4.2	23.6	21.7		
	II	2	25.9	15.4	24.8	22.8	23.7	22.5	22.1	27.8

Table 12. Distribution of 1/2" thick asbestos-phenolic pipe insulation

Size	Qty	Density	1/2" thick asbestos-phenolic insulation	Qty	Density	Size
1-1/2	1	11.1	5.0	1	11.1	1-1/2
	2	5.6	2.5	2	5.6	
	3	3.7	1.7	3	3.7	
2	1	13.9	6.3	1	13.9	2
	2	7.0	3.2	2	7.0	
	3	4.6	2.1	3	4.6	
2-1/2	1	16.7	7.6	1	16.7	2-1/2
	2	8.4	3.8	2	8.4	
	3	5.6	2.5	3	5.6	
3	1	19.2	8.7	1	19.2	3
	2	9.6	4.4	2	9.6	
	3	6.4	2.9	3	6.4	
3-1/2	1	21.4	9.7	1	21.4	3-1/2
	2	10.8	4.9	2	10.8	
	3	7.2	3.3	3	7.2	
4	1	23.8	10.8	1	23.8	4
	2	12.0	5.4	2	12.0	
	3	8.0	3.6	3	8.0	
4-1/2	1	26.3	11.9	1	26.3	4-1/2
	2	13.2	6.0	2	13.2	
	3	8.8	4.0	3	8.8	
5	1	28.6	13.0	1	28.6	5
	2	14.4	6.5	2	14.4	
	3	9.6	4.4	3	9.6	
6	1	33.3	15.1	1	33.3	6
	2	16.8	7.6	2	16.8	
	3	11.2	5.1	3	11.2	
8	1	43.5	19.7	1	43.5	8
	2	21.9	9.9	2	21.9	
	3	14.6	6.6	3	14.6	
10	1	52.6	23.9	1	52.6	10
	2	26.4	12.0	2	26.4	
	3	17.6	8.0	3	17.6	
12	1	62.5	28.3	1	62.5	12
	2	31.4	14.2	2	31.4	
	3	20.8	9.4	3	20.8	
14	1	71.4	32.4	1	71.4	14
	2	35.8	16.2	2	35.8	
	3	23.8	10.8	3	23.8	
16	1	80.0	36.3	1	80.0	16
	2	40.2	18.2	2	40.2	
	3	26.8	12.2	3	26.8	
18	1	90.0	40.8	1	90.0	18
	2	45.2	20.5	2	45.2	
	3	30.2	13.7	3	30.2	
20	1	100.0	45.4	1	100.0	20
	2	50.2	22.8	2	50.2	
	3	33.4	15.2	3	33.4	
24	1	120.0	54.4	1	120.0	24
	2	60.2	27.3	2	60.2	
	3	40.2	18.2	3	40.2	

ISOLATION SEED INCREASE

The planting of small plots of certain lines in isolation in the Lake Worth area was continued during 1954. The selection of lines for isolation increase in the spring of 1954 was based on data from the 1953 yield test and data obtained during 1953 on resistance to C. hibisci race 3. Because of unusually cool weather during February and March, these lines failed to produce a spring crop of seed. The plants were left standing through the summer, and good seed yields were obtained in the fall. Unfortunately, all these lines are quite susceptible to C. hibisci race 2. However, the seed of certain of these lines will be valuable in genetic and pathology studies, and no further increases of these lines is planned.

After testing all lines for reaction to C. hibisci race 2 at Fort Lauderdale during the summer of 1954, several of the most promising lines were planted in fall isolation blocks. As discussed elsewhere in this report, the resistance of many of these lines failed to hold up in the fall nursery. Actually, only one line in isolation looked good for resistance to race 2, and in this line certain progenies were susceptible, and progeny rogueing was necessary. Efforts are being made to carry this line forward in isolation in the spring of 1955. Plans are also being made to place at least three other lines in isolation. It is hoped that plantings can be made early enough and that weather conditions are favorable so that good seed yields will be obtained.

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The planting of small plots of certain lines in isolation in the Lake Worth area was continued during 1954. The selection of lines for isolation increase in the spring of 1954 was based on data from the 1953 yield test and data obtained during 1953 on resistance to U. blighti race 3. Because of unusually cool weather during February and March, these lines failed to produce a spring crop of seed. The plants were left standing through the summer, and good seed yields were obtained in the fall. Unfortunately, all these lines are quite susceptible to U. blighti race 2. However, the seed of certain of these lines will be valuable in genetic and pathology studies, and no further increases of these lines is planned.

After testing all lines for resistion to U. blighti race 2 at Fort Lauderdale during the summer of 1954, several of the most promising lines were planted in fall isolation blocks. As discussed elsewhere in this report, the resistance of many of these lines failed to hold up in the fall nursery. Actually, only one line in isolation looked good for resistance to race 2, and in this line certain progenies were susceptible, and progeny rogueing was necessary. Efforts are being made to carry this line forward in isolation in the spring of 1955. Plans are also being made to place at least three other lines in isolation. It is hoped that plantings can be made early enough and that weather conditions are favorable so that good seed yields will be obtained.

GENETIC STUDIES

1. Inheritance of resistance to C. hibisci race 3:

Crosses between two highly resistant and two completely susceptible S_1 Salvadorian lines were made in 1952 to begin studies of the inheritance of resistance to C. hibisci. Parents and F_1's were grown and inoculated in 1953. Resistance was found to be completely dominant in the F_1 (see 1953 annual report).

Seed of one CS line was lost, and the study in the 1954 spring nursery was limited to parents, F_1, F_2 and backcross generations of two lines. Reaction of these populations following inoculation with C. hibisci race 3 are given in Table 13.

The complete susceptibility of BG-52-10 is evident from the table. A few plants of the highly resistant parent showed various degrees of susceptibility, but apparently such reactions were due to natural infections of race 2 (isolates tested by Dr. Summers were found to be race 2). BG-52-29 is completely susceptible to race 2.

In the F_1 all plants were HR except for one R classification. All five class reactions were found in the F_2. Since plants classified R give only a slight reaction at the point of inoculation and I plants give definite lesions above or below the point of inoculation, plants of the HR and R classes were combined and considered resistant, while plants of the I, S and CS classes were combined and considered susceptible. When this is done a good fit to a 3 resistant and 1 susceptible ratio is obtained in the F_2.

In the two backcross populations, all five class reactions were found, but it is probable that the four I, S and CS plants in the

GENETIC STUDIES

1. Inheritance of resistance to *S. bilobal* race 3:

Crosses between two highly resistant and two completely susceptible Salvadorian lines were made in 1952 to begin studies of the inheritance of resistance to *S. bilobal*. Parents and F_1's were grown and inoculated in 1953. Resistance was found to be completely dominant in the F_1 (see 1953 annual report).

Seed of one S3 line was lost, and the study in the 1954 spring nursery was limited to parents, F_1, F_2 and backcross generations of two lines. Reaction of these populations following inoculation with *S. bilobal* race 3 are given in Table 13.

The complete susceptibility of PI-52-10 is evident from the table. A few plants of the highly resistant parent showed various degrees of susceptibility, but apparently such reactions were due to natural infections of race 2 (isolates tested by Dr. Suneson were found to be race 2). PI-52-29 is completely susceptible to race 2.

In the F_1 all plants were MR except for one R classification. All five class reactions were found in the F_2. Three plants classified R give only a slight reaction at the point of inoculation and I plants give definite lesions above or below the point of inoculation. Plants of the MR and S classes were combined and considered resistant, while plants of the I, S and S classes were combined and considered susceptible. When this is done a good fit to a 3 resistant and 1 susceptible ratio is obtained in the F_2.

In the two backcross populations, all five class reactions were found, but it is probable that the four I, S and S plants in the

Table 13. Classification of kenaf parental lines and the F_1, F_2 and backcross generations for resistance to *C. hibisci* race 3

Parent or Generation	Number of Plants HR	R	I	S	CS	Number of Plants HR + R	I + S + CS	Assumed Ratio	Chi Square	P
BG-52-10	0	0	0	0	58	0	58	-	-	-
BG-52-29	83	5	3	1	0	88	4	-	-	-
BG-52-29 x BG-52-10 F_1	29	1	0	0	0	30	0	-	-	-
BG-52-29 x BG-52-10 F_2	110	8	2	19	18	118	39	3:1	-	.97
(BG-52-29 x BG-52-10) x BG-52-29	30	10	1	1	2	40	4	-	-	-
(BG-52-29 x BG-52-10) x BG-52-10	20	8	6	7	15	28	28	1:1	0	1.00

Table 13. Classification of Pearl Millet Germplasm Lines for Resistance to Downy Mildew in Field Conditions at Different Locations in India, 1982

Entry No.	Pedigree	Number of plants tested	Number of plants infected	Percentage of infection	Reaction
1	(BD-25-26 × BD-25-10) (BD-25-26 × BD-25-10)	100	0	0	R
2	(BD-25-26 × BD-25-10) (BD-25-26 × BD-25-10)	100	0	0	R
3	(BD-25-26 × BD-25-10) (BD-25-26 × BD-25-10)	100	0	0	R
4	(BD-25-26 × BD-25-10) (BD-25-26 × BD-25-10)	100	0	0	R
5	(BD-25-26 × BD-25-10) (BD-25-26 × BD-25-10)	100	0	0	R
6	(BD-25-26 × BD-25-10) (BD-25-26 × BD-25-10)	100	0	0	R
7	(BD-25-26 × BD-25-10) (BD-25-26 × BD-25-10)	100	0	0	R
8	(BD-25-26 × BD-25-10) (BD-25-26 × BD-25-10)	100	0	0	R
9	(BD-25-26 × BD-25-10) (BD-25-26 × BD-25-10)	100	0	0	R
10	(BD-25-26 × BD-25-10) (BD-25-26 × BD-25-10)	100	0	0	R
11	(BD-25-26 × BD-25-10) (BD-25-26 × BD-25-10)	100	0	0	R
12	(BD-25-26 × BD-25-10) (BD-25-26 × BD-25-10)	100	0	0	R
13	(BD-25-26 × BD-25-10) (BD-25-26 × BD-25-10)	100	0	0	R
14	(BD-25-26 × BD-25-10) (BD-25-26 × BD-25-10)	100	0	0	R
15	(BD-25-26 × BD-25-10) (BD-25-26 × BD-25-10)	100	0	0	R
16	(BD-25-26 × BD-25-10) (BD-25-26 × BD-25-10)	100	0	0	R
17	(BD-25-26 × BD-25-10) (BD-25-26 × BD-25-10)	100	0	0	R
18	(BD-25-26 × BD-25-10) (BD-25-26 × BD-25-10)	100	0	0	R
19	(BD-25-26 × BD-25-10) (BD-25-26 × BD-25-10)	100	0	0	R
20	(BD-25-26 × BD-25-10) (BD-25-26 × BD-25-10)	100	0	0	R
21	(BD-25-26 × BD-25-10) (BD-25-26 × BD-25-10)	100	0	0	R
22	(BD-25-26 × BD-25-10) (BD-25-26 × BD-25-10)	100	0	0	R
23	(BD-25-26 × BD-25-10) (BD-25-26 × BD-25-10)	100	0	0	R
24	(BD-25-26 × BD-25-10) (BD-25-26 × BD-25-10)	100	0	0	R
25	(BD-25-26 × BD-25-10) (BD-25-26 × BD-25-10)	100	0	0	R
26	(BD-25-26 × BD-25-10) (BD-25-26 × BD-25-10)	100	0	0	R
27	(BD-25-26 × BD-25-10) (BD-25-26 × BD-25-10)	100	0	0	R
28	(BD-25-26 × BD-25-10) (BD-25-26 × BD-25-10)	100	0	0	R
29	(BD-25-26 × BD-25-10) (BD-25-26 × BD-25-10)	100	0	0	R
30	(BD-25-26 × BD-25-10) (BD-25-26 × BD-25-10)	100	0	0	R
31	(BD-25-26 × BD-25-10) (BD-25-26 × BD-25-10)	100	0	0	R
32	(BD-25-26 × BD-25-10) (BD-25-26 × BD-25-10)	100	0	0	R
33	(BD-25-26 × BD-25-10) (BD-25-26 × BD-25-10)	100	0	0	R
34	(BD-25-26 × BD-25-10) (BD-25-26 × BD-25-10)	100	0	0	R
35	(BD-25-26 × BD-25-10) (BD-25-26 × BD-25-10)	100	0	0	R
36	(BD-25-26 × BD-25-10) (BD-25-26 × BD-25-10)	100	0	0	R
37	(BD-25-26 × BD-25-10) (BD-25-26 × BD-25-10)	100	0	0	R
38	(BD-25-26 × BD-25-10) (BD-25-26 × BD-25-10)	100	0	0	R
39	(BD-25-26 × BD-25-10) (BD-25-26 × BD-25-10)	100	0	0	R
40	(BD-25-26 × BD-25-10) (BD-25-26 × BD-25-10)	100	0	0	R
41	(BD-25-26 × BD-25-10) (BD-25-26 × BD-25-10)	100	0	0	R
42	(BD-25-26 × BD-25-10) (BD-25-26 × BD-25-10)	100	0	0	R
43	(BD-25-26 × BD-25-10) (BD-25-26 × BD-25-10)	100	0	0	R
44	(BD-25-26 × BD-25-10) (BD-25-26 × BD-25-10)	100	0	0	R
45	(BD-25-26 × BD-25-10) (BD-25-26 × BD-25-10)	100	0	0	R
46	(BD-25-26 × BD-25-10) (BD-25-26 × BD-25-10)	100	0	0	R
47	(BD-25-26 × BD-25-10) (BD-25-26 × BD-25-10)	100	0	0	R
48	(BD-25-26 × BD-25-10) (BD-25-26 × BD-25-10)	100	0	0	R
49	(BD-25-26 × BD-25-10) (BD-25-26 × BD-25-10)	100	0	0	R
50	(BD-25-26 × BD-25-10) (BD-25-26 × BD-25-10)	100	0	0	R
51	(BD-25-26 × BD-25-10) (BD-25-26 × BD-25-10)	100	0	0	R
52	(BD-25-26 × BD-25-10) (BD-25-26 × BD-25-10)	100	0	0	R
53	(BD-25-26 × BD-25-10) (BD-25-26 × BD-25-10)	100	0	0	R
54	(BD-25-26 × BD-25-10) (BD-25-26 × BD-25-10)	100	0	0	R
55	(BD-25-26 × BD-25-10) (BD-25-26 × BD-25-10)	100	0	0	R
56	(BD-25-26 × BD-25-10) (BD-25-26 × BD-25-10)	100	0	0	R
57	(BD-25-26 × BD-25-10) (BD-25-26 × BD-25-10)	100	0	0	R
58	(BD-25-26 × BD-25-10) (BD-25-26 × BD-25-10)	100	0	0	R
59	(BD-25-26 × BD-25-10) (BD-25-26 × BD-25-10)	100	0	0	R
60	(BD-25-26 × BD-25-10) (BD-25-26 × BD-25-10)	100	0	0	R
61	(BD-25-26 × BD-25-10) (BD-25-26 × BD-25-10)	100	0	0	R
62	(BD-25-26 × BD-25-10) (BD-25-26 × BD-25-10)	100	0	0	R
63	(BD-25-26 × BD-25-10) (BD-25-26 × BD-25-10)	100	0	0	R
64	(BD-25-26 × BD-25-10) (BD-25-26 × BD-25-10)	100	0	0	R
65	(BD-25-26 × BD-25-10) (BD-25-26 × BD-25-10)	100	0	0	R
66	(BD-25-26 × BD-25-10) (BD-25-26 × BD-25-10)	100	0	0	R
67	(BD-25-26 × BD-25-10) (BD-25-26 × BD-25-10)	100	0	0	R
68	(BD-25-26 × BD-25-10) (BD-25-26 × BD-25-10)	100	0	0	R
69	(BD-25-26 × BD-25-10) (BD-25-26 × BD-25-10)	100	0	0	R
70	(BD-25-26 × BD-25-10) (BD-25-26 × BD-25-10)	100	0	0	R
71	(BD-25-26 × BD-25-10) (BD-25-26 × BD-25-10)	100	0	0	R
72	(BD-25-26 × BD-25-10) (BD-25-26 × BD-25-10)	100	0	0	R
73	(BD-25-26 × BD-25-10) (BD-25-26 × BD-25-10)	100	0	0	R
74	(BD-25-26 × BD-25-10) (BD-25-26 × BD-25-10)	100	0	0	R
75	(BD-25-26 × BD-25-10) (BD-25-26 × BD-25-10)	100	0	0	R
76	(BD-25-26 × BD-25-10) (BD-25-26 × BD-25-10)	100	0	0	R
77	(BD-25-26 × BD-25-10) (BD-25-26 × BD-25-10)	100	0	0	R
78	(BD-25-26 × BD-25-10) (BD-25-26 × BD-25-10)	100	0	0	R
79	(BD-25-26 × BD-25-10) (BD-25-26 × BD-25-10)	100	0	0	R
80	(BD-25-26 × BD-25-10) (BD-25-26 × BD-25-10)	100	0	0	R
81	(BD-25-26 × BD-25-10) (BD-25-26 × BD-25-10)	100	0	0	R
82	(BD-25-26 × BD-25-10) (BD-25-26 × BD-25-10)	100	0	0	R
83	(BD-25-26 × BD-25-10) (BD-25-26 × BD-25-10)	100	0	0	R
84	(BD-25-26 × BD-25-10) (BD-25-26 × BD-25-10)	100	0	0	R
85	(BD-25-26 × BD-25-10) (BD-25-26 × BD-25-10)	100	0	0	R
86	(BD-25-26 × BD-25-10) (BD-25-26 × BD-25-10)	100	0	0	R
87	(BD-25-26 × BD-25-10) (BD-25-26 × BD-25-10)	100	0	0	R
88	(BD-25-26 × BD-25-10) (BD-25-26 × BD-25-10)	100	0	0	R
89	(BD-25-26 × BD-25-10) (BD-25-26 × BD-25-10)	100	0	0	R
90	(BD-25-26 × BD-25-10) (BD-25-26 × BD-25-10)	100	0	0	R
91	(BD-25-26 × BD-25-10) (BD-25-26 × BD-25-10)	100	0	0	R
92	(BD-25-26 × BD-25-10) (BD-25-26 × BD-25-10)	100	0	0	R
93	(BD-25-26 × BD-25-10) (BD-25-26 × BD-25-10)	100	0	0	R
94	(BD-25-26 × BD-25-10) (BD-25-26 × BD-25-10)	100	0	0	R
95	(BD-25-26 × BD-25-10) (BD-25-26 × BD-25-10)	100	0	0	R
96	(BD-25-26 × BD-25-10) (BD-25-26 × BD-25-10)	100	0	0	R
97	(BD-25-26 × BD-25-10) (BD-25-26 × BD-25-10)	100	0	0	R
98	(BD-25-26 × BD-25-10) (BD-25-26 × BD-25-10)	100	0	0	R
99	(BD-25-26 × BD-25-10) (BD-25-26 × BD-25-10)	100	0	0	R
100	(BD-25-26 × BD-25-10) (BD-25-26 × BD-25-10)	100	0	0	R

backcross to the HR parent were due to race 2. In the backcross to the completely susceptible parent, a perfect 1 resistant to 1 susceptible ratio is obtained after pooling the classes.

These results indicate that resistance to race 3 is completely dominant and that resistance is conditioned by one major gene pair. However, it seems probable modifying genes are concerned in the differentiation of the R, I, S and CS classes.

Seed were produced in these populations during the fall of 1954, and F_3 backcross progeny seed are now available. Realizing that larger populations need to be tested for publication purposes, more F_2 and backcross seed were produced. Also for publication purposes, two more lines (BG-51-3, completely susceptible and BG-51-1 highly resistant) were brought into this study. These two lines were crossed reciprocally and in all possible combinations with BG-52-10 and BG-52-29.

2. Inheritance of reaction to C. hibisci race 2:

In the fall nursery, two lines (BG-52-18 and BG-52-33) CS to race 2 were crossed reciprocally with three lines (BG-51-7, BG-52-1 and BG-52-7) showing an intermediate reaction to race 2. These 20 F_1's and their parents will be planted and inoculated in the fall 1955 nursery and certain crosses chosen for selfing and backcrossing to continue studies on the inheritance of reaction to race 2. Since all five of the lines chosen for this study are HR re races 1 and 3, natural infections with races other than 2 should not occur unless other races of the organism should appear. From this standpoint,

backcrosses to the HR parent were due to race 2. In the backcrosses to the completely susceptible parent, a perfect 1 resistant to 1 susceptible ratio is obtained after pooling the classes.

These results indicate that resistance to race 3 is completely dominant and that resistance is conditioned by one major gene pair. However, it seems probable modifying genes are concerned in the differentiation of the R, I, S and CS classes.

Seed were produced in these populations during the fall of 1954, and F3 backcross progeny seed are now available. Realizing that larger populations need to be tested for publication purposes, more F2 and backcross seed were produced. Also for publication purposes, two more lines (BO-52-3, completely susceptible and BO-52-1 highly resistant) were brought into this study. These two lines were crossed reciprocally and in all possible combinations with BO-52-10 and BO-52-29.

2. Inheritance of reaction to Q. biglobosa race 2:

In the fall nursery, two lines (BO-52-15 and BO-52-33) CS to race 2 were crossed reciprocally with three lines (BO-52-7, BO-52-1 and BO-52-7) showing an intermediate reaction to race 2. These 20 F_1's and their parents will be planted and inoculated in the fall 1955 nursery and certain crosses chosen for selfing and backcrossing to continue studies on the inheritance of reaction to race 2. Since all five of the lines chosen for this study are HR to races 1 and 3, natural infections with races other than 2 should not occur unless other races of the organism should appear. From this standpoint,

this study should be somewhat easier to conduct than the inheritance of reaction to race 3.

3. Inheritance of leaf shape:

Crosses between an entire and a divided leaf S_1 Salvadorian line were made in 1952 to initiate studies on the inheritance of leaf shape. The F_1 and parents were grown in 1953. Divided leaf shape was found to be completely dominant. (See 1953 annual report.)

The parents, F_1, F_2 and backcross generations were planted in the spring nursery. Results of the classification for leaf shape are given in Table 14. F_1 plants were divided in shape. The F_2 segregated in a ratio of 3 divided to 1 entire. All plants of the backcross to the divided parent were divided. The backcross to the entire parent segregated in a ratio of 1 divided to 1 entire, although the fit to a 1:1 ratio was not too good, due perhaps to the small number of plants grown.

Seed were produced on these plants during the fall months of 1954. Self-pollinations were made in the F_2 and backcross populations to give F_3 and backcross progeny seed. It is evident from Table 14 that larger F_2 and backcross populations should be grown in order to publish this data. Accordingly, more F_2 and backcross seed were produced.

Also for publication purposes, more crosses of lines should be brought into this study and observed at least through the F_1 generation. Therefore, BG-51-1 (entire) and BG-51-3 (Divided) were crossed reciprocally and in all possible combinations with BG-52-29 and BG-52-31.

this study should be somewhat easier to conduct than the inheritance of resistance to rust 3.

3. Inheritance of leaf shape:

Crosses between an entire and a divided leaf Sj Salvadorian line were made in 1952 to initiate studies on the inheritance of leaf shape. The F_1 and parents were grown in 1953. Divided leaf shape was found to be completely dominant. (See 1953 annual report.)

The parents, F_1, F_2 and backcross generations were planted in the spring nursery. Results of the classification for leaf shape are given in Table 14. F_1 plants were divided in shape. The F_2 segregated in a ratio of 3 divided to 1 entire. All plants of the backcross to the divided parent were divided. The backcross to the entire parent segregated in a ratio of 1 divided to 1 entire, although the fit to a 1:1 ratio was not too good, due perhaps to the small number of plants grown.

Seed were produced on these plants during the fall months of 1954. Self-pollinations were made in the F_2 and backcross populations to give F_3 and backcross progeny seed. It is evident from Table 14 that larger F_2 and backcross populations should be grown in order to publish this data. Accordingly, more F_2 and backcross seed were produced.

Also for publication purposes, more crosses of lines should be brought into this study and observed at least through the F_3 generation. Therefore, DB-31-1 (entire) and DB-31-3 (divided) were crossed reciprocally and in all possible combinations with DB-32-29 and DB-32-31.

Table 14. Classification of kenaf parental lines and the F_1, F_2 and backcross generations for leaf shape

Parent or Generation	Number of Plants Divided	Number of Plants Entire	Assumed Ratio	Chi Square	P
BG-52-29	94	0	-	-	-
BG-52-31	0	90	-	-	-
BG-52-29 x BG-52-31 F_1	14	0	-	-	-
BG-52-29 x BG-52-31 F_2	124	40	3:1	.032	.87
(BG-52-29 x BG-52-31) x BG-52-29	38	0	-	-	-
(BG-52-29 x BG-52-31) x BG-52-31	26	14	1:1	3.60	.06

Table 14. Classification of normal parental lines and the F_1, F_2 and backcross generations for leaf shape

Parent or Generation	Number of Plants Divided	Entire	Ratio Assumed	Chi Square	P
MC-32-29	94	0	-	-	-
MC-32-31	0	90	-	-	-
MC-32-29 x MC-32-31 F_1	14	0	-	-	-
MC-32-29 x MC-32-31 F_2	124	40	3:1	.032	.87
(MC-32-29 x MC-32-31) x MC-32-29	38	0	-	-	-
(MC-32-29 x MC-32-31) x MC-32-31	26	12	1:1	3.60	.06

4. Male sterility:

Two plants in a progeny of BG-52-52 were found to be completely male sterile. All other plants in this progeny and in other progenies of this line were completely fertile. These two male sterile plants were sib-pollinated to maintain the male sterile counterpart of the line (temporarily designated BG-52-52 MS). Three of the best lines (BG-51-7, BG-52-1 and BG-52-7) from the standpoint of resistance to C. hibisci race 2 were crossed on the male sterile plants to begin genetic studies of the male sterility factor and as the first step in incorporating male sterility into some of the best lines.

Obviously the first question to be answered concerning this male sterility is its behavior genetically. If the sterility holds up, a number of interesting possibilities come to mind. There has been some thought among kenaf workers concerning hybrid vigor and the possibilities of making use of it in commercial varieties. Though no detailed studies have been made, it has been observed that considerable vigor does result from crossing divergent kenaf lines. However, breeding for greater vigor insofar as plant size is concerned is not a problem for Florida if kenaf is to be grown on the peat soils. (In fact, the problem is to select for smaller plants.) However, in other areas where the fertility level is lower, hybrid vigor in kenaf might contribute materially to yields.

Another hybrid possibility is kenaf and the nematode resistant ornamental. While the F_1 is rather severely affected by nematodes, it does have the ability to make some growth, and it might have possibilities on severely infested soils. Nothing is known con-

4. Male sterility:

Two plants in a progeny of BC-52-52 were found to be completely male sterile. All other plants in this progeny and in other progenies of this line were completely fertile. These two male sterile plants were sib-pollinated to maintain the male sterile counterpart of the line (temporarily designated BC-52-52 MS). Three of the best lines (BC-52-7, BC-52-1 and BC-52-7) from the standpoint of resistance to C. lilioleci race 2 were crossed on the male sterile plants to begin genetic studies of the male sterility factor and as the first step in incorporating male sterility into some of the best lines.

Obviously the first question to be answered concerning this male sterility is its behavior genetically. If the sterility holds up, a number of interesting possibilities come to mind. There has been some thought among kenaf workers concerning hybrid vigor and the possibilities of making use of it in commercial varieties. Though no detailed studies have been made, it has been observed that considerable vigor does result from crossing divergent kenaf lines. However, breeding for greater vigor insofar as plant size is concerned is not a problem for Florida if kenaf is to be grown on the peat soils. (In fact, the problem is to select for smaller plants.) However, in other areas where the fertility level is lower, hybrid vigor in kenaf might contribute materially to yields.

Another hybrid possibility is kenaf and the nematode resistant ornamental. While the Pj is rather severely affected by nematodes, it does have the ability to make some growth, and it might have possibilities on severely infested soils. Nothing is known con-

cerning the yield of this hybrid, but it does branch excessively like kenaf when given space. Crowding would probably control the branching. If the male sterility holds up, this hybrid should be tested for yield and other agronomic characters.

5. Inheritance of petal spot:

An intense reddish-purple basal petal spot is characteristic of most all types of kenaf. The spot is reasonably well delimited in green stem types, but in red and purple stem types the spot color may extend far out into the petals, particularly along the veins. In 1953, an introduction from Egypt (PI 20923) was found to be segregating for petal spot vs. no petal spot (perhaps similar to the ghost spot character in cotton). Certain selfed selections made in this introduction are now breeding true for the no petal spot character. Appropriate crosses have been made to study the inheritance of petal spot.

6. Inheritance of stem color:

Stem color in kenaf varies from green to dark purple with various intermediate pinks and reds. Early in the breeding program, the green stem Salvadorian variety was crossed with a purple stem Javanese variety. The F_1 was found to be intermediate in color and the F_2 segregated in a 1-2-1 ratio. A severe infection of C. hibisci made it impossible to continue this experiment.

Selection within the Salvadorian variety has shown that it is not pure for stem color. Lines with completely green stems and petioles have been extracted, as well as lines that develop a pinkish tinge on

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Selection within the Salvadorian variety has shown that it is not pure for stem color. Lines with completely green stems and petioles have been extracted, as well as lines that develop a pinkish tinge on

the stems and petioles. The pinkish type depends on the sun for intensity, and should be considered a sun-red factor. Appropriate crosses have been made to study the inheritance of stem color.

SUMMARY - BREEDING STUDIES IN SANSEVIERIA AND KENAF IN 1954

Severe disease and cold injury occurred in sansevieria plantings at Fort Lauderdale and Belle Glade, and some damage was noted at Lake Worth. A few trifasciata seedling clones were superior to the parent species in disease and cold resistance. The trifasciata-deserti hybrids appear to have considerable potentiality for fiber because of a rapid rate of growth and the ability to produce fiber leaves without the establishment of a dense stand of plants. These hybrids compare favorably with trifasciata in percent and quality of fiber, can be easily propagated by leaf cuttings and appear to have good disease and cold resistance.

The trifasciata-deserti hybrids were found to be fertile and 107 seedlings of the backcross to trifasciata were obtained. The trifasciata-parva hybrids are also fertile, but the trifasciata-liberica hybrids are apparently sterile. Hybrids of reciprocal crosses of trifasciata and aethopica were obtained. More hybrids of trifasciata and deserti were produced.

All kenaf lines were tested for reaction to C. hibisci race 2. Many Salvadorian lines highly resistant to race 3 were found to be completely susceptible to race 2. Several Salvadorian lines were uniformly intermediate in reaction to race 2. It appears that such lines could be grown for fiber or seed without serious effect from the disease. Four of these lines have been placed in isolation to begin an increase of seed.

The best resistance to race 2 was found in an F_4 Salvadorian x Javanese line and in two S_1 lines out of an Egyptian introduction. All plants in these three lines were classified resistant.

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All kenaf lines were tested for reaction to Q. biblata race 2. Many Salvadorian lines highly resistant to race 3 were found to be completely susceptible to race 2. Several Salvadorian lines were uniformly intermediate in reaction to race 2. It appears that such lines could be grown for fiber or seed without serious effect from the disease. Four of these lines have been placed in isolation to begin an increase of seed.

The best resistance to race 2 was found in an F_4 Salvadorian x Javanese line and in two F_3 lines out of an Egyptian introduction. All plants in these three lines were classified resistant.

Studies on the interspecific hybrid of kenaf and the root-knot nematode resistant H. setveldianus were continued. F_1, F_2 and F_3 plants were found to be almost completely sterile. F_1 plants treated with colchicine yielded several seed.

Two strain tests were conducted at Belle Glade. Susceptible lines were severely affected by C. hibisci race 2. Regression calculations revealed that the major portion of the line variation in percent fiber, green yield and dry fiber yield was due to percent susceptibility to C. hibisci. Regression and correlation coefficients for percent susceptibility with the three factors mentioned above were negative and highly significant.

Studies on the inheritance of resistance to C. hibisci race 3 were continued. Resistance was found to be completely dominant in the F_1. The reaction of backcross and F_2 populations indicates that resistance is conditioned by one major gene pair with possible modifying genes concerned in the differentiation of the five reaction classes.

Leaf shape studies revealed dominance of the divided leaf. Segregation in F_2 and backcross populations indicate one gene pair is concerned in the inheritance of leaf shape.

Two plants in a progeny of BG-52-52 were found to be male sterile. Some of the possible uses of a male sterile kenaf are discussed.

Studies on the interspecific hybrid of kenaf and the root-knot nematode resistant H. cannabinus were continued. F_1, F_2 and F_3 plants were found to be almost completely sterile. F_1 plants treated with colchicine yielded several seed.

Two strain tests were conducted at Bella Glade. Susceptible lines were severely affected by O. biloculi race 2. Regression calculations revealed that the major portion of the line variation in percent fiber, green yield and dry fiber yield was due to percent susceptibility to O. biloculi. Regression and correlation coefficients for percent susceptibility with the three factors mentioned above were negative and highly significant.

Studies on the inheritance of resistance to O. biloculi race 2 were continued. Resistance was found to be completely dominant in the F_1. The reaction of backcross and F_2 populations indicates that resistance is conditioned by one major gene pair with possible modifying genes concerned in the differentiation of the five reaction classes.

Leaf shape studies revealed dominance of the divided leaf. Segregation in F_2 and backcross populations indicate one gene pair is concerned in the inheritance of leaf shape.

Two plants in a progeny of 30-32-52 were found to be male sterile. Some of the possible uses of a male sterile kenaf are discussed.